

# AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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August 1993

# **AEROSPACE MEDICINE AND BIOLOGY**

A CONTINUING BIBLIOGRAPHY WITH INDEXES



National Aeronautics and Space Administration  
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# INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 185 reports, articles and other documents recently announced in the NASA STI Database. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue include:

<i>Scientific and Technical Aerospace Reports (STAR)</i> (N-10000 Series)	N93-25138 — N93-27097
<i>International Aerospace Abstracts</i> (A-10000 Series)	A93-33481 — A93-37500

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations include the original accession numbers from the respective announcement journals.

Seven indexes—subject, personal author, corporate source, foreign technology, contract, report number, and accession number—are included.

A cumulative index for 1993 will be published in early 1994.

Information on availability of documents listed, addresses of organizations, and CASI price schedules are located at the back of this issue.



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## TYPICAL REPORT CITATION AND ABSTRACT

NASA SPONSORED  
ON MICROFICHE

ACCESSION NUMBER → N93-12195\*# ← LOCKHEED ENGINEERING AND SCIENCES CO., HOUSTON, TX. ← CORPORATE SOURCE

TITLE → ASTRONAUT CANDIDATE STRENGTH MEASUREMENT USING THE CYBEX 2 AND THE LIDO MULTI-JOINT 2 DYNAMOMETERS Final Report

AUTHORS → AMY E. CARROLL and ROBERT P. WILMINGTON May 1992 ← PUBLICATION DATE

CONTRACT NUMBER → (Contract NAS9-17900)

REPORT NUMBERS → (NASA-CR-185679; NAS 1.26:185679; LESC-30277) Avail: CASI HC

PRICE CODE → A03/MF A01 ← AVAILABILITY SOURCE

The Anthropometry and Biomechanics Laboratory in the man-Systems division at NASA's Johnson Space Center has as one of its responsibilities the anthropometry and strength measurement data collection of astronaut candidates. The anthropometry data is used to ensure that the astronaut candidates are within the height restrictions for space vehicle and space suit design requirements, for example. The strength data is used to help detect abnormalities or isolate injuries to muscle groups that could jeopardize the astronauts safety. The Cybex II Dynamometer has been used for strength measurements from 1985 through 1991. The Cybex II was one of the first instruments of its kind to measure strength and similarity of muscle groups by isolating the specific joint of interest. In November 1991, a LIDO Multi-Joint II Dynamometer was purchased to upgrade the strength measurement data collection capability of the Anthropometry and Biomechanics Laboratory. The LIDO Multi-Joint II Dynamometer design offers several advantages over the Cybex II Dynamometer including a more sophisticated method of joint isolation and a more accurate and efficient computer based data collection system. Author

## TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

ACCESSION NUMBER → A93-11150

TITLE → STUDIES TOWARDS THE CRYSTALLIZATION OF THE ROD VISUAL PIGMENT RHODOPSIN

AUTHORS → W. J. DE GRIP, J. VAN OOSTRUM, and G. L. J. DE CALUWE

AUTHORS' AFFILIATION → (Nijmegen Catholic Univ., Netherlands) Journal of Crystal Growth (ISSN 0022-0248) vol. 122, no. 1-4 Aug. 1992 p. 375-384. ← JOURNAL TITLE

Research supported by SRON refs (Contract NWO-SON-328-050) ← PUBLICATION DATE

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Results are presented of crystallization experiments on bovine rhodopsin, which established a restricted range of conditions which reproducibly yield rhodopsin crystals. Several parameters were optimized, including the detergent, the precipitant, additives, and pH. The crystals obtained so far are too small (less than 50 microns in any direction) or of insufficient order to allow high-resolution diffraction analysis. Several approaches are proposed for improving the average size, stability, and order of the rhodopsin crystals.

I.S.

# AEROSPACE MEDICINE AND BIOLOGY

*A Continuing Bibliography (Suppl. 378)*

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## LIFE SCIENCES (GENERAL)

**A93-34518**

### **TWO CIRCADIAN OSCILLATORS IN ONE CELL**

TILL ROENNEBERG (Munich Univ., Germany) and DAVID MORSE (Montreal Univ., Canada) *Nature* (ISSN 0028-0836) vol. 362, no. 6418 March 25, 1993 p. 362-364. Research supported by DFG and NSERC refs

Copyright

It is shown here in the unicellular alga *Gonyaulax polyedra* that instead of one clock controlling all circadian rhythms of the cell, there are at least two, and at the limit, a separate oscillator for each rhythm. The possible relationship of this phenomenon to photosynthesis is briefly considered. AIAA

**A93-34581\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

### **THE BIOLOGICAL FLIGHT RESEARCH FACILITY**

CATHERINE C. JOHNSON (NASA, Ames Research Center, Moffett Field, CA) *Microgravity Quarterly* (ISSN 0958-5036) vol. 2, no. 2 1992 p. 115-121. IAF, International Astronautical Congress, 42nd, Montreal, Canada, Oct. 5-11, 1991, IAF Paper 91-578. Previously cited in issue 05, p. 759, Accession no. A92-18567 refs

Copyright

**A93-34858**

### **ON THE BIOLOGICAL EFFECTS OF COSMIC RAYS - EPIDEMIOLOGICAL STUDIES**

C. SIGNORINI (CNR, Ist. di Fisica dello Spazio Interplanetario, Rome, Italy) and A. M. CONFORTO (Roma I, Univ., Rome, Italy) *Nuovo Cimento C, Serie 1* (ISSN 0390-5551) vol. 15 C, no. 5 Sept.-Oct. 1992 p. 565-573. Previously announced in STAR as N93-17596 refs

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The determination of the biological effects of cosmic rays and other natural radiation to resolve the more general problem of the consequences on human health, from the basis of ionizing radiation, is addressed. Difficulties relating to an epidemiological study are outlined and results are discussed particularly concerning their inconsistency. In particular, high and low doses are discussed, referencing the Hiroshima bomb, the HBRA (High Background Radiation Area), and the CA (Control Area). High and low regions are discussed for the case of cancer. Author

**A93-35210**

**LIPID PEROXIDATION AND THE ANTIOXIDANT DEFENSE SYSTEM IN RATS AFTER A 13-DAY FLIGHT ON THE COSMOS-1887 BIOSATELLITE [PEREKISNOE OKISLENIE LIPIDOV I SISTEMA ANTIKSIDANTNOI ZASHCHITY U KRY'S POSLE 13-SUTOCHNOGO KOSMICHESKOGO POLETA NA BIOSPUTNIKE 'KOSMOS-1887']**

A. A. MARKIN and N. V. DELENIAN *Aviakosmicheskaya i*

*Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 1 Jan.-Feb. 1992 p. 43-45. In Russian. refs

Copyright

The parameters of lipid peroxidation and the antioxidant defense system were measured in the blood plasma, myocardium, skeletal muscles, and liver of rats. Results show that the liver level of diene conjugates, Schiff bases, and tocopherol decreased, while superoxide dismutase and catalase activities increased. In the skeletal muscles the diene conjugate contents increased followed by decreases in the malonic dialdehyde (MDL) and superoxide dismutase activity. In the blood plasma the levels of tocopherol, MDL, and total antioxidant activity were elevated. The observed changes in lipid peroxidation are considered to be caused by the last dynamic stage of the space flight and readaptation to the earth environment. O.G.

**A93-35211**

### **SPONTANEOUS AND EVOKED ACTIVITY OF NEURONS IN THE PARIETAL ASSOCIATIVE CORTEX OF CATS DURING MOTION SICKNESS [SPONTANNAIA I VYZVANNAYA AKTIVNOST' NEIRONOV TEMENNOI ASSOTSIIATIVNOI KORY U KOSHEK V PROTSESSE UKACHIVANIIA]**

V. A. PRAVDIVTSEV, S. B. KOZLOV, and V. V. IASNETSOV *Aviakosmicheskaya i Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 1 Jan.-Feb. 1992 p. 46-49. In Russian. refs

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Spontaneous and evoked neuron activity in the parietal associative cortex was studied in 18 cats during motion sickness. It was found that, after 15 min of motion sickness, 54 percent of the 57 neurons examined exhibited suppression and 20 percent of the neurons increased their spontaneous activity. Twenty-six percent of the neurons did not respond to motion sickness. The dynamics of evoked neural responses was complex, and changes in evoked responses did not agree with those in the spontaneous cellular activity. More consistent changes in evoked responses were found in the neurons exhibiting phase responses to the flight environment and electrocutaneous stimulation. O.G.

**A93-35212**

### **HEMATOLOGIC STATUS OF RATS BORN AND GROWN IN A HYPERGRAVITY ENVIRONMENT [GEMATOLOGICHESKII STATUS KRY'S, RODIVSHIKHSIA I VYROSSHIKH V USLOVIAKH POVYSHENNOI SILY TIAZHESTI]**

T. E. BURKOVSKAIA and I. B. KRASNOV *Aviakosmicheskaya i Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 1 Jan.-Feb. 1992 p. 50-52. In Russian. refs

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The blood and bone marrow morphology of rats whose prenatal and postnatal development up to the age of 60 and 75 days took place under 2g gravity conditions under a continuous centrifuge rotation was studied. Response to reduced gravity was examined in 60-day-old rats on postrotation days 2 and 15. Postrotation rats exhibited an intensified erythropoiesis which resulted in elevated erythroid cell counts, activated eosinophilopoiesis, and a decreased level of neutrophilopoiesis. In 75-day rats, erythro- and granulocytopoieses showed a tendency to recovery, and the bone marrow population of lymphoid and plasma cells was significantly decreased. It is concluded that hemopoiesis adaptation to the increased gravity is not accomplished, and the hematologic status depends on a changed status of the controlling systems. O.G.

A93-35213

**A COMPARATIVE ANALYSIS OF THE BONE MARROW CELL COMPOSITION IN RATS FOLLOWING A LONG-DURATION CONTINUOUS OR INTERRUPTED EXPOSURE TO A HYPOGEOMAGNETIC FIELD [SRAVNITEL'NAIA KHARAKTERISTIKA KLETOCHNOGO SOSTAVA KOSTNOGO MOZGA KRYIS POSLE DLITEL'NOGO POSTOIANNOGO ILI PRERYVISTOGO DEISTVIA GIPOGEOMAGNITNOGO POLIA]**

V. V. AZARENKO and R. V. SMIRNOV. *Aviakosmicheskaja i Ekologicheskaja Meditsina* (ISSN 0233-528X) vol. 26, no. 1 Jan.-Feb. 1992 p. 52, 53. In Russian. refs

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The bone marrow cell composition in male Wistar rats exposed to a continuous or interrupted hypogeomagnetic field (HGMF) with an attenuation coefficient of 172.5 was studied. Results obtained indicate that the long-term exposure to a weak terrestrial magnetic field causes a particular eosinophilia of the bone marrow due to an increased fraction of mature eosinophils. Under an interrupted HGMF exposure, there was a significant myelogram elevation of the mast cell counts by 1.4 percent. O.G.

A93-35215

**A FREE-FALL FLIP-OVER RESPONSE IN RATS AFTER THE FLIGHT ONBOARD THE COSMOS-936 BIOSATELLITE [REAKTSIIA PEREVORACHIVANIJA PRI SVOBODNOM PADENII U KRYIS POSLE POLETA NA BIOSPUTNIKE 'KOSMOS-936']**

G. S. AIZIKOV, A. S. MARKIN, and A. A. SHIPOV. *Aviakosmicheskaja i Ekologicheskaja Meditsina* (ISSN 0233-528X) vol. 26, no. 1 Jan.-Feb. 1992 p. 62-64. In Russian. refs

Copyright

A free-fall flip-over response in weightless and centrifuged rats flown onboard Cosmos 936 was studied. Particular changes in the response of weightless rats were found after landing, while eyes-closed centrifuged rats did not exhibit any response. It is concluded that under conditions of simulated gravity direct vision plays the major role in orientation. O.G.

A93-35217

**PHARMACOLOGICAL DEFENSE OF THE BRAIN DURING RADIATION DAMAGE - SOME ARGUMENTS [FARMAKOLOGICHESKAIA ZASHCHITA MOZGA PRI RADIATIONNOM PORAZHENii - NEKOTORYE ARGUMENTY]**

B. I. DAVYDOV and I. B. USHAKOV. *Aviakosmicheskaja i Ekologicheskaja Meditsina* (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 6-11. In Russian. refs

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Scientific arguments for and against using pharmacological countermeasures to protect the brain against radiation damage are examined. Attention is given to positive and negative effects of the countermeasures with various neurotropic properties. A general scheme is presented that makes it possible to search for means of pharmacological correction of the radiocerebral syndrome involving the following stages: a pathophysiological analysis of cerebral disorders, selection of behaviorally significant criteria, search for means of pharmacological correction, experimental animal studies with extrapolation of the results to humans, simulation of the radiocerebral syndrome, field testing, and decision making (biomedical and formalized approaches). AIAA

A93-35224

**FEATURES OF THE EFFECT OF HYPOKINESIA ON CARDIAC ACTIVITY IN RATS WITH HIGH AND LOW SPONTANEOUS MOTOR ACTIVITY [OSOBENNOSTI VLIJANIJA GIPOKINEZII NA SERDECHNUIU DEIATEL'NOST' U KRYIS S VYSOKOI I NIZKOI SPONTANNOI DVIATEL'NOI AKTIVNOST'IU]**

A. A. TEZOV, V. I. KISELEV, and V. P. KULIKOV. *Aviakosmicheskaja i Ekologicheskaja Meditsina* (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 46-49. In Russian. refs

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The effects of hypokinesia on cardiac contractivity and vegetative regulation were studied in rats with high and low spontaneous motor activity. It is shown that hypokinesia promotes

the depression of stroke volume and a decrease in sympathetic nervous activity in rats with low motor activity. These parameters were not significantly affected by hypokinesia in rats with high motor activity. AIAA

A93-35225

**ACCUMULATION OF CALCIUM IONS IN THE MYOCARDIAL SARCOPLASMIC RETICULUM OF RESTRAINED RATS EXPOSED TO A PULSED ELECTROMAGNETIC FIELD [AKKUMULIATSIIA IONOV KAL'TSIIA SARKOPLAZMATICHESKIM RETIKULUMOM SERDECHNOI MYSHTSY KRYIS V USLOVIAKH OGRANICHENNOI PODVIZHNOSTI I PRI VOZDEISTVII IMPUL'SNYM ELEKTROMAGNITNYM POLEM]**

V. A. LOGINOV. *Aviakosmicheskaja i Ekologicheskaja Meditsina* (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 49-51. In Russian. refs

Copyright

Change in the rate of  $\text{Ca}^{2+}$  accumulation was studied in myocardial homogenates from restrained rats that were chronically (1 and 2 months) exposed to a pulsed electromagnetic field with a frequency of 1 Hz and a magnetic induction of 6-24 mT. A decrease in this variable by 33 percent was observed in the course of a month, while restoration of the rate of  $\text{Ca}^{2+}$  transport was shown after two months of exposure. AIAA

A93-35229

**EFFECT OF AN ATTENUATED GEOMAGNETIC FIELD ON THE CELLULAR COMPOSITION OF THE EPITHELIAL-SPERMOGENOUS LAYER OF RAT TESTES [VLIJANIE OSLABLENNOGO MAGNITNOGO POLIA ZEMLI NA KLETOCHNYI SOSTAV EPITELIO-SEMIARODNOGO SLOIA IAICHEK KRYIS]**

R. V. SMIRNOV and G. F. CHULKOVA. *Aviakosmicheskaja i Ekologicheskaja Meditsina* (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 71-73. In Russian. refs

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An experiment was devised to study changes in the epithelial-spermatogenic layer of rat testes after a prolonged stay in an attenuated geomagnetic field. The data appear to indicate a weak stimulating effect of hypomagnetic fields on spermatogenesis. AIAA

A93-35232

**CENTRAL NEUROPHYSIOLOGICAL AND NEUROCHEMICAL VOMITING MECHANISMS (REVIEW OF THE LITERATURE) [TSENTRAL'NYE NEIROFIZIOLOGICHESKIE I NEIROKHIMICHESKIE MEKHANIZMY RVOTY /OBZOR LITERATURY/]**

V. V. IASNETSOV. *Aviakosmicheskaja i Ekologicheskaja Meditsina* (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 10-18. In Russian. refs

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Present-day evidence for neurophysiological and neurochemical mechanisms of the functioning of the central components of the vomiting reflex is presented. The role of some brain structures in motion-sickness-induced vomiting is highlighted. Literature data casting doubt on the traditional view of the necessary involvement of some brain structures in the initiation of vomiting induced by motion sickness are discussed. Consideration is also given to results of studies of the effect of physiologically active substances (classical neuromediators and regulatory peptides) at a neuronal level (silent postremal cells) with the presence of an emetic effect in them during systemic administration. AIAA

A93-35240

**MORPHOLOGICAL ANALYSIS OF THE HEPATIC STRUCTURES IN EXPERIMENTAL ANIMALS AFTER INFRASONIC EXPOSURE [MORFOLOGICHESKOE ISSLEDOVANIE STRUKTUR PECHENI EKSPERIMENTAL'NYKH ZHIVOTNYKH PRI DEISTVII INFRAZVUKA]**

A. S. NEKHOROSHEV and V. V. GLINCHIKOV. *Aviakosmicheskaja*



i *Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 56-59. In Russian. refs  
Copyright

Results of experimental investigations of the effects of infrasound on the hepatic structures of laboratory animals are presented. Such elements of the liver as hepatocytes and small vessels were found to be most sensitive to 3-h/d infrasound exposure during 5 to 40 d. Changes in the liver were of a local nature and were manifested by ischemic areas with hepatocyte morphological and histochemical changes. Hepatocyte changes after 5-to-40-day infrasound exposure exhibited increased functional activity. Longer exposure (25 and 40 d) yielded irreversible changes in hepatocytes. These results indicate that 8- and 16-Hz infrasound produces more pronounced histological, histochemical, and ultrastructural changes than 2- and 4-Hz infrasound. It is suggested that the above frequencies can indirectly impair cell organelles and nuclear chromatin and affect hepatocyte functioning. AIAA

A93-35242

**THE INKUBATOR-2 COMPLEX FOR STUDYING THE EMBRYONIC AND POSTEMBRYONIC DEVELOPMENT OF BIRDS IN CONDITIONS OF WEIGHTLESSNESS [KOMPLEKS 'INKUBATOR-2' DLYA IZUCHENIYA EMBRYONAL'NOGO I POSTEMBRYONAL'NOGO RAZVITIYA PTITS V USLOVIYAKH NEVESOMOSTI]**

V. P. RUMIANTSEV, B. L. PEREPECH, A. D. NOSKIN, A. I. PAKHOMOV, V. V. POPOV, T. V. BATENCHUK-TUSKO, G. S. ALEKSEEVA, SH. MAEK, I. ZONGOR, and V. SABO *Aviakosmicheskaya i Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 65, 66. In Russian.  
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Attention is given to the Inkubator-2 complex, used for performing the joint Soviet-Czechoslovak experiment on board the Mir orbital complex to study embryonic and postembryonic development of birds in weightlessness. Inkubator-2 is designed to ensure the incubation of quail eggs, the maintenance of chicks and adult birds on board the Mir complex, and the delivery of eggs to the Mir complex for incubation and that of adult birds for subsequent maintenance in orbital flight. During an experiment in late March 1990, 35 developing eggs yielded eight normally developed chicks, six of which left the shell on their own. AIAA

A93-35246

**TURNING-OVER REACTION DURING FREE FALL IN LABYRINTHECTOMIZED RATS AFTER A FLIGHT ON THE COSMOS 936 BIOSATELLITE [REAKTSIYA PEREVRACHIVANIYA PRI SVOBODNOM PADENII U DELABIRINTIROVANNYKH KRYIS POSLE POLETA NA BIOSPUTNIKE 'KOSMOS-936']**

G. S. AIZIKOV, A. S. MARKIN, and A. A. SHIPOV *Aviakosmicheskaya i Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 75-77. In Russian. refs  
Copyright

Experimental data on a turning-over reaction in labyrinthectomized rats after an 18.5-d flight on Cosmos 936 are presented. On earth, the labyrinthectomized rats were found over time to exhibit an activation of the gaze fixation reflex (GFR), which replaces the labyrinth function when a turning-over reaction is executed. In microgravity, in the labyrinthectomized rats there is no activation of GFR, and a postflight turning-over reaction is absent in the rats. AIAA

A93-35248

**ECOLOGICAL-MORPHOLOGICAL FEATURES OF THE GROWTH AND DISTRIBUTION OF CULTURES OF UNICELLULAR ORGANISMS IN A GRAVITATIONAL FIELD [EKOLOGO-MORFOLOGICHESKIE OSOBENNOSTI ROSTA I RASPREDELENIYA KULTUR ODNOKLETCHNYKH ORGANIZMOV V GRAVITATSIONNOM POLE]**

M. G. TAIRBEKOV and A. V. GABOVA *Aviakosmicheskaya i Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 8-14. In Russian. refs  
Copyright

Experimental data on the general regularities of the growth, distribution, and behavioral parameters of unicellular organisms under conditions of reduced gravity in the 0.00001-5-g range are summarized and analyzed. Studies were performed on representatives of three simple classes: Ciliata, Flagellata, and Sarcodina. It is shown that the intensity of the gravitational effect on these characteristics of unicellular organisms depends greatly on the type of environment, the types of cells, and their metabolic levels. The effects of changed gravity at the cellular levels are the consequence of the shifting of the primary physiological characteristics and physical-chemical parameters of the culture and the cell environments as an integrated biological system. AIAA

A93-35258

**SOME INDICES OF HUMORAL IMMUNITY IN RHESUS MONKEYS UNDER THE EFFECT OF EXTREME SPACE FLIGHT FACTORS [NEKOTORYE POKAZATELI GUMORAL'NOGO IMMUNITETA U OBEZ'IAN MAKAK REZUSOV PRI DEISTVII EKSTREMAL'NYKH FAKTOROV KOSMICHESKOGO POLETA]**

M. A. POCHKHUA *Aviakosmicheskaya i Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 50-54. In Russian. refs  
Copyright

Some indices of the nonspecific resistance of Rhesus monkeys (G and A immunoglobulins and C3 complement component) are investigated. The standards of IgG, IgA, and C3 complement component in healthy Rhesus monkeys are determined. Changes in the parameters of the nonspecific resistance of the animals during all stages of their preflight training and shortly after the flight experiment have been studied. These changes were first manifested as an increase in the IgA level. AIAA

A93-35259

**HEMODYNAMICS IN MONKEYS DURING ANTIORTHOSTATIC HYPOKINESIA AT ANGLES OF -6 AND -20 DEG [GEMODINAMIKA U OBEZ'IAN VO VREMIA ANTIORTOSTATICHESKOI GIPOKINEZII POD UGLOM -6 I -20 DEG]**

V. P. KROTOV and E. V. TRAMBOVETSKII *Aviakosmicheskaya i Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 54-57. In Russian. refs  
Copyright

Hemodynamic changes in monkeys (two groups of three animals each) during 6 and 20 deg head down tilts (HDTs) of various durations have been investigated. An increase in the arterial blood pressure and linear velocity of the blood flow in the common carotid artery (CCA) was observed immediately after HDT followed, by a compensatory decrease of the values. A significant decline in the orthostatic tolerance after 20-deg HDT with the development of a precollapoid state was also found. The changes in the circulation pattern in the CCA bed are induced by a cranial shifting of the body fluids. AIAA

A93-35260

**HEALING OF FRACTURED BONE IN RATS DURING READAPTATION FOLLOWING 14-DAY SUSPENSION [ZAZHIVLENIE PERELOMOV KOSTEI U KRYIS V PERIODE READAPTATSII POSLE 14-SUTOCHNOGO VYVESHIVANIYA]**  
G. N. DURNOVA, T. E. BURKOVSKAYA, and A. S. KAPLANSKII *Aviakosmicheskaya i Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 57-59. In Russian. refs  
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Histological, histochemical, and histomorphometric methods were used to investigate the effect of a 14-day head-down suspensions on the healing of fractured fibular diaphysis in rats traumatized immediately after suspension. The data obtained suggest that, in the readaptation period after the 14-day suspension resulting in osteoporotic changes of weight-bearing bones, a repair process in the bones is rapidly normalized. AIAA

A93-35261

**DYNAMICS OF THE CENTRAL AND PERIPHERAL CIRCULATION OF ACTIVE RATS ON THE FIRST DAY OF ANTIORTHOSTATIC HYPOKINESIA (THE ROLE OF TRAINING) [DINAMIKA TSENTRAL'NOGO I PERIFERICHESKOGO KROVOOBRAZHENIYA U BODRSTVUIUSHCHIKH KRYV PERYE SUTKI ANTIORTOSTATICHESKOI GIPOKINEZII /ROL' TRENIROVKI/]**

E. I. BYCHKOVA, V. P. KROTOV, E. B. MOLEVA, and O. S. MEDVEDEV. *Aviakosmicheskaya i Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 60-64. In Russian. refs  
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The effect of preliminary antiorthostatic training on the systemic and regional hemodynamics in male Wistar rats during 24-hour head-down tilt (HDT) were investigated. The main parameters of the systemic hemodynamics changed to a smaller degree in trained animals than in the controls. Blood flow changes in the organs and tissues tended to be the same, though these changes were less severe in the trained rats. AIAA

A93-35262

**COMBINED EFFECT OF HEAD-DOWN TILT AND GAMMA RAYS ON THE HIGHER NERVOUS ACTIVITY OF RATS [KOMBINIROVANNOE DEISTVIE ANTIORTOSTATICHESKOI GIPODINAMII I GAMMA-OBLUCHENIYA NA VYSSHIU NERVNUIU DEIATEL'NOST' KRYV]**

A. S. SHTEMBERG. *Aviakosmicheskaya i Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 64-67. In Russian. refs  
Copyright

The paper presents an investigation of the combined effect of 30-day head-down tilt (HDT) and gamma rays at a dose of 3 Gy on the higher nervous activity of experimental rats. The immobilization and isolation stresses induced by the HDT in the rats are found to lead to the development of pathological aggressive reaction with the disorders of a species-typical pattern of an aggressive act and a long-term change in the social relations of the animals. AIAA

A93-35263

**EARLY ANDROLOGICAL EFFECTS IN RATS UNDER THE COMBINED EFFECT OF IRRADIATION AND VIBRATION [RANNIE ANDROLOGICHESKIE EFFEKTY U KRYV PRI SOCHETANNOE DEISTVIE OBLUCHENIYA I VIBRATSII]**

I. B. USHAKOV, M. S. EVTEEVA, M. M. KULINICHEVA, and M. M. ABRAMOV. *Aviakosmicheskaya i Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 67-70. In Russian. refs  
Copyright

The spermatogenic epithelium of rat testes was investigated under the combined effect of vibration and irradiation; the data were analyzed with the special-purpose program STX. Five hours after separate exposures to vibration and irradiation, a decrease in proliferation was observed, which was expressed in a reduction in the number of spermatogones, first-order spermatocytes, and spermatids. This reduction became particularly pronounced under the combined effect of the two factors. AIAA

A93-35264

**INTERLABYRINTH OTOLITHIC ASYMMETRY UNDER NORMAL CONDITIONS AND AFTER THE EFFECT OF A GRAVITY CHANGE [MEZHLABIRINTNAIA OTOLITOVAIA ASIMMETRIYA V NORME I POSLE VOZDEISTVIA IZMENENNOI SILY TIAZHISTI]**

D. V. LYCHAKOV. *Aviakosmicheskaya i Ekologicheskaya Meditsina* (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 71-74. In Russian. refs  
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The effect of a gravity change on the interlabyrinth otolith asymmetry in fish and frog larvae (grown aboard the Salyut-6 orbital station) was investigated. It is shown that the effect of

gravity change on the growing or developing otolith apparatus does not produce a statistically reliable change in the interlabyrinth otolith asymmetry. AIAA

A93-35498 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**MUSCLE MITOCHONDRIAL DENSITY AFTER EXHAUSTIVE EXERCISE IN DOGS - PROLONGED RESTRICTED ACTIVITY AND RETRAINING**

K. NAZAR, J. E. GREENLEAF, D. PHILPOTT, E. POHOSKA, K. OLSZEWSKA, and H. KACIUBA-USCILKO (Polish Academy of Sciences, Medical Research Centre, Warsaw, Poland; NASA, Ames Research Center, Moffett Field, CA) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562) vol. 64, no. 4 April 1993 p. 306-313. Research supported by Polish Academy of Sciences refs

(Contract RTOP 199-18-12-07)

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The effect of exhaustive treadmill exercise on mitochondrial density (MD) and ultrastructural changes in quadriceps femoris muscle was studied in 7 normal, healthy, male mongrel dogs before and after restricted activity (RA) and following a subsequent 2-month exercise retraining period. Mean time to exhaustion in the 2-month group decreased from 177 +/- 11 min before to 90 +/- 16 min after RA; retraining increased tolerance to 219 +/- 36 min above the pre-RA and 143 percent above the post-RA time. Post-RA exhaustion time in the 5-months group was 25 and 45 min. Muscle samples taken after RA showed abnormalities indicative of degeneration, which were reversed by retraining. Resting MD decreased from a control level of 27.8 percent to 14.7 percent and 16.3 percent, and was restored to 27.1 percent after retraining. Exhaustive exercise caused an increase in MD under control conditions and after RA, but not following retraining. Disruption of mitochondria after exercise was evident after 5-month confinement. Factors causing mitochondrial changes and eventually their disruption during exercise after restricted activity are not related as much to the state of fatigue as to the pre-exercise quality of the muscle modified by disease or training.

Author (revised)

A93-35670

**EFFECT OF LOW-FREQUENCY VIBRATION ON THE ACTIVITY OF DEHYDROGENASES IN NEURONS OF THE NUCLEUS VESTIBULARIS ANTERIOR OF RATS [VPLIV NIZ'KOCHASTOTNOI VIBRATSII NA AKTIVNIST' DEGIDROGENAZ U NEIRONAKH PEREDN'OGO VESTIBULIARNOGO IADRA SHCHURIV]**

B. A. NASIBULLIN, V. A. ROZANOV, and M. B. IANOVSKII (Odesskii Meditsinskii Inst., Odessa, Ukraine) *Fiziologicheskii Zhurnal (Kiev)* (ISSN 0201-8489) vol. 39, no. 1 Jan.-Feb. 1993 p. 3-10. In Ukrainian. refs

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The effect of the exposure to low-frequency vibration (8 Hz for periods from 1 to 30 days) on the characteristics of redox processes in the neurons of the nucleus vestibularis anterior (NVA) of rats was investigated by measuring activities of NADH-, NADPH-, succinate-, malate, beta-oxybutyrate-, alpha-glycerolphosphate-, lactate-, glutamate-, and 6-phosphogluconate-dehydrogenases. Using histochemical methods for obtaining quantitative estimates of the enzyme content in a given neuron subpopulation, the sizes of subpopulations in the NVA of rats from different experimental groups were estimated. It was found that the enzymatic changes caused by vibration resembled those taking place during adaptation to hypoxia. AIAA

A93-35671

**THE STATE OF THE ENDOCRINE SYSTEM OF RATS OF DIFFERENT AGE UNDER CONDITIONS OF IMMOBILIZATION STRESS AND BIOMOS ADMINISTRATION [STAN ENDOKRINNOI SISTEMI SHCHURIV RIZNOGU VIKU V ADOVAKH IMMOBILIZATSII NOGO STRESU I VPLIVU ADAPTOGENU BIOMOSU]**

M. I. ALESINA, O. O. SUKACHOVA, S. TS. ZIL'BERMAN, O. O.

KONOVALENKO, G. O. NESTERENKO, and O. M. BESKROVNII (NPO Biomos, Kharkov, Ukraine) *Fiziologicheskii Zhurnal* (Kiev) (ISSN 0201-8489) vol. 39, no. 1 Jan.-Feb. 1993 p. 78-83. In Ukrainian. refs

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The effect of the administration (via a stomach zond) of a biomos preparation (0.01 g per 100 g body mass) on the blood content of thyroidal hormones, insulin, corticosterone, and glucose in rats subjected to immobilization stress was investigated in immobilized and control rats aged 3 and 24 months. It was found that the administration of a biomos preparation (a polymer-metal complex extracted from oak tissues) prior to immobilization prevented the appearance of abnormalities in the endocrine system of animals, typical of the effect of immobilization stress, such as decreases in the concentration of insulin and thyroid hormones and increases of corticosterone and glucose in blood of immobilized animals. AIAA

A93-35672

**PEROXIDATIVE OXIDATION OF LIPIDS AND CHROMOSOME ABERRATIONS IN MICE AFTER REPEATED EXPOSURES TO A HELIUM-OXYGEN RESPIRATION MIXTURE UNDER HYPERBARIC CONDITIONS [PEREKISNOE OKISLENIE LIPIDOV I KHROMOSOMNYE ABERRATSII U MYSHEI POSLE MNOGOKRATNOGO VOZDEISTVIA GELIOKISLORODNOI DYKHATEL'NOI SMES'IU V REZHIME GIPERBARI]**

T. P. SHKURAT, N. P. MILIUTINA, A. E. NECHEPURENKO, T. A. KOSHCHEVA, V. M. SAPOZHNIKOV, E. I. NOVIKOVA, I. V. TIMOFEEVA, E. I. SHIMANSKAIA, and B. S. DASHEVSKII (Rostovskii Gosudarstvennyi Univ., Rostov-on-Don, Russia) *Fiziologicheskii Zhurnal* (Kiev) (ISSN 0201-8489) vol. 39, no. 1 Jan.-Feb. 1993 p. 89-96. In Russian. refs

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The effect of repeated exposures to elevated atmospheric pressure (3.6 MPa) in a O<sub>2</sub>-He atmosphere on the peroxidative oxidation of lipids (POL) and on chromosome morphology was investigated in mice subjected to five sessions of 6 h compression, followed by 5 d isopression, and then by 18 h decompression in 20-80 percent He-O<sub>2</sub> atmospheric mixture, with 10 days between each session. It was found that one to three sessions of hyperbary caused increases of diene conjugates and schiff bases in the erythrocyte membranes and in blood plasma. One-session exposure led to the inhibition of superoxide dismutase, while three to five sessions led to the activation of this enzyme. Chromosomal aberrations were detected in bone marrow three months after the experiments, after only one session of hyperbary. AIAA

A93-35679

**ION TRANSPORT ACROSS MEMBRANES UNDER EXPOSURE OF THE ORGANISM TO IONIZING RADIATION [TRANSMEMBRANNYI PERENOS IONOV PRI DEISTVII IONIZIRUIUSHCHEI RADIATSII NA ORGANIZM]**

ANATOLII I. DVORETSKII, SENERIK N. AIRAPETIAN, ALLA M. SHAINSKAIA, and EVGENII E. CHEBOTAREV Kiev Izdatel'stvo Naukova Dumka 1990 136 p. In Russian. refs (ISBN 5-12-001601-4) Copyright

Current concepts relating to the transport function of biological membranes under conditions of ionizing radiation are presented. In particular, attention is given to radiation-induced disturbances of ion transport across membranes and to the disturbance of the homeostatic balance for monovalent cations. The discussion also covers the mechanisms of postradiation changes in the mechanism of ion transport in membranes and the effect of radiation-induced disturbance of Na- and K-activated ATPase on the metabolism and functions of the neural cell. AIAA

A93-36555

**ROLES OF WATER MOLECULES IN BACTERIA AND VIRUSES**

C. S. COX (Chemical and Biological Defence Establishment, Salisbury, United Kingdom) *Origins of Life and Evolution of the Biosphere* (ISSN 0169-6149) vol. 23, no. 1 Feb. 1993 p. 29-36. Water in the solar system and its role in exobiology; Proceedings of the European Geophysical Society General

Assembly, 26th, Wiesbaden, Germany, Apr. 22-26, 1991. A93-36551 14-55 refs

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In addition to water, microbes mainly comprise lipids, carbohydrates, proteins and nucleic acids. Their structure and function singularly and conjointly is affected by water activity. Desiccation leads to dramatic lipid phase changes whereas carbohydrates, proteins and nucleic acids initially suffer spontaneous, reversible low activation energy Maillard reactions forming products that more slowly re-arrange, cross-link etc. to give non-native states. While initial products spontaneously may reverse to native states by raising water activity, later products only do so through energy consumption and enzymatic activity eg. repair. Yet, native states of lipid membranes and associated enzymes are required to generate energy. Consequently, good reserves of high energy compounds (e.g. ATP) and of membrane stabilisers (e.g. trehalose) may be expected to enhance survival following drying and rehydration (e.g. anhydrobiotic organisms). Author

A93-36557\* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**COMPARISON OF MEMBRANE ATPASES FROM EXTREME HALOPHILES ISOLATED FROM ANCIENT SALT DEPOSITS**

HELGA STAN-LOTTER (Vienna Univ., Austria; NASA, Ames Research Center, Moffett Field, CA), MICHAEL SULZNER, EVA EGELSEER (Vienna Univ., Austria), CYNTHIA F. NORTON (Maine Univ., Augusta), and LAWRENCE I. HOCHSTEIN (NASA, Ames Research Center, Moffett Field, CA) *Origins of Life and Evolution of the Biosphere* (ISSN 0169-6149) vol. 23, no. 1 Feb. 1993 p. 53-64. Water in the solar system and its role in exobiology; Proceedings of the European Geophysical Society General Assembly, 26th, Wiesbaden, Germany, Apr. 22-26, 1991. A93-36551 14-55 Research supported by Ministry of Science and Research of Austria refs (Contract NCC2-578)

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Halophilic microorganisms were isolated from Triassic and Permian salt deposits. Two were rods and grew as red colonies; another was a coccus and produced pink colonies. The rods lysed in solutions that lacked added sodium chloride. Growth of all isolates was inhibited by aphidicolin and their bulk-proteins were acidic as judged from isoelectric focusing. Therefore, these organisms were tentatively identified as extreme halophiles. Whole cell proteins patterns of the isolates following gel electrophoresis were distinct and differed from those of representative type strains of halophilic bacteria. The membrane ATPases from the rods were similar to the enzyme from *Halobacterium saccharovororum* with respect to subunit composition, enzymatic properties and immunological cross-reaction, but differed slightly in amino acid composition. If the age of the microbial isolated is similar to that of the salt deposits, they can be considered repositories of molecular information of great evolutionary interest. Author

A93-36559

**LIFE IN HOT SPRINGS AND HYDROTHERMAL VENTS**

ANDREAS H. SEGERER, SIGFRIED BURGGRAF, GERHARD FIALA, GERTRUD HUBER, URSULA PLEY, and KARL O. STETTER (Regensburg Univ., Germany) *Origins of Life and Evolution of the Biosphere* (ISSN 0169-6149) vol. 23, no. 1 Feb. 1993 p. 77-90. Water in the solar system and its role in exobiology; Proceedings of the European Geophysical Society General Assembly, 26th, Wiesbaden, Germany, Apr. 22-26, 1991. A93-36551 14-55 refs

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The hyperthermophilic microorganisms, which live in hot springs and hydrothermal systems at temperatures of as much as 110 C, can by diverse metabolic means exist either aerobically or anaerobically: as is presently discussed for representative cases of the 45 known species of hyperthermophiles. Within such ecosystems, primary production is independent of solar energy; this, in conjunction with their numerous and phylogenetically highly

divergent evolutionary lineages, has wide-ranging consequences for exobiological investigations. AIAA

A93-36562

**SOME PROTEINS KEEP 'LIVING FOSSIL' PRE-SEQUENCE**

ORLIN KH. IVANOV (Bulgarian Academy of Sciences, Inst. of Organic Chemistry, Sofia, Bulgaria) Origins of Life and Evolution of the Biosphere (ISSN 0169-6149) vol. 23, no. 2 April 1993 p. 115-124. Research supported by National Foundation Scientific Investigation refs Copyright

The sequences of hydrophobic segments of exported bacterial proteins, serine proteinases, and all known plastocyanins are analyzed to study subsequences differing in amino acid composition and primary structure regularities. It is concluded that a well preserved 'living fossil' sequence exists in the chain of some proteins. The extension in protein precursor cleaved by a proteolysis demonstrates a higher share of usual amino acids (Thr, Pro, Ala, Ser, Arg, Gly, Leu, Val, Glu, and Asp) and more clearly expressed periodicity compared to the mature protein. AIAA

N93-25195\*

Lockheed Engineering and Sciences Co., Washington, DC.

**DIGEST OF RUSSIAN SPACE LIFE SCIENCES, ISSUE 33**

LYDIA RAZRAN STONE, ed., RONALD TEETER, ed., and JOSEPH ROWE, ed. (Library of Congress, Washington, DC.) Washington NASA Mar. 1993 108 p (Contract NASW-4292)

(NASA-CR-3922(39); NAS 1.26:3922(39)) Avail: CASI HC A06

This is the thirty-third issue of NASA's USSR Space Life Sciences Digest. It contains abstracts of 55 papers published in Russian journals. The abstracts in this issue have been identified as relevant to the following areas of space biology and medicine: biological rhythms, body fluids, botany, cardiovascular and respiratory systems, developmental biology, endocrinology, equipment and instrumentation, gastrointestinal system, genetics, hematology, human performance, metabolism, microbiology, musculoskeletal system, neurophysiology, nutrition, operational medicine, psychology, radiobiology, and reproductive system. Author

N93-25242\*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**SPACE BIOLOGY RESEARCH DEVELOPMENT Final Report, 1 Apr. 1989 - 31 Mar. 1993**

SJOERD L. BONTING 31 Mar. 1993 15 p

(Contract NCC2-614)

(NASA-CR-192830; NAS 1.26:192830) Avail: CASI HC A03/MF A01

The purpose of the Search for Extraterrestrial Intelligence (SETI) Institute is to conduct and promote research related activities regarding the search for extraterrestrial life, particularly intelligent life. Such research encompasses the broad discipline of 'Life in the Universe', including all scientific and technological aspects of astronomy and the planetary sciences, chemical evolution, the origin of life, biological evolution, and cultural evolution. The primary purpose was to provide funding for the Principal Investigator to collaborate with the personnel of the SETI Institute and the NASA-Ames Research center in order to plan and develop space biology research on and in connection with Space Station Freedom; to promote cooperation with the international partners in the space station; to conduct a study on the use of biosensors in space biology research and life support system operation; and to promote space biology research through the initiation of an annual publication 'Advances in Space Biology and Medicine'. Author (revised)

N93-25405# Joint Publications Research Service, Arlington, VA. JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: LIFE SCIENCES

25 Nov. 1992 49 p Transl. into ENGLISH from various Russian articles

(JPRS-ULS-92-025) Avail: CASI HC A03/MF A01

The translated article covers the following topic: changes in the psychophysiological characteristics in the visual system with different retina and visual nerve pathology in humans with low vision as a result of transcutaneous stimulation of visual path periphery. CASI

N93-25406# Joint Publications Research Service, Arlington, VA. JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: LIFE SCIENCES

4 Aug. 1992 34 p Transl. into ENGLISH from various Russian articles

(JPRS-ULS-92-020) Avail: CASI HC A03/MF A01

The translated article covers the following topic: satellite monitoring and normative prognosis for ecosystem dynamics in the Amudar Delta. Author

N93-25457# President's Council of Advisors on Science and Technology, Washington, DC.

**ACHIEVING THE PROMISE OF THE BIOSCIENCE REVOLUTION: THE ROLE OF THE FEDERAL GOVERNMENT**

Dec. 1992 19 p Original contains color illustrations

(PB93-139970) Avail: CASI HC A03/MF A01

This report deals with the role of the federal government in achieving two goals: (1) promoting the health of the American people and all mankind through research in the biosciences; and (2) fostering a vigorous American biotechnology industry. These goals are inter-related. Discoveries in the biosciences are the basis for industrial development of more effective ways to prevent or treat illness, produce more nutritious foods, make use of renewable energy sources, and protect the environment. A critical factor in the continued success of America's biotechnology industry is the strength of the nation's bioscience research enterprise. Author

N93-25566\*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**MEASURING THE METASTATIC POTENTIAL OF CANCER CELLS**

DENNIS R. MORRISON, HOWARD GRATZNER (DNA Sciences, Houston, TX.), and M. Z. ATASSI (Baylor Coll. of Medicine, Houston, TX.) In NASA, Washington, Technology 2002: The Third National Technology Transfer Conference and Exposition, Volume 1 p 59-70 Feb. 1993

Avail: CASI HC A03/MF A04

Cancer cells must secrete proteolytic enzymes to invade adjacent tissues and migrate to a new metastatic site. Urokinase (uPA) is a key enzyme related to metastasis in cancers of the lung, colon, gastric, uterine, breast, brain, and malignant melanoma. A NASA technology utilization project has combined fluorescence microscopy, image analysis, and flow cytometry, using fluorescent dyes, and urokinase-specific antibodies to measure uPA and abnormal DNA levels (related to cancer cell proliferation) inside the cancer cells. The project is focused on developing quantitative measurements to determine if a patient's tumor cells are actively metastasizing. If a significant number of tumor cells contain large amounts of uPA (esp. membrane-bound) then the post-surgical chemotherapy or radiotherapy can be targeted for metastatic cells that have already left the primary tumor. These analytical methods have been applied to a retrospective study of biopsy tissues from 150 node negative, stage 1 breast cancer patients. Cytopathology and image analysis has shown that uPA is present in high levels in many breast cancer cells, but not found in normal breast. Significant amounts of uPA also have been measured in glioma cell lines cultured from brain tumors. Commercial applications include new diagnostic tests for metastatic cells, in different cancers, which are being developed with a company that provides a medical testing service using flow cytometry for DNA analysis and hormone receptors on tumor cells from patient biopsies. This research also may provide the basis for developing a new 'magic bullet' treatment against metastasis using chemotherapeutic drugs or radioisotopes attached to urokinase-specific monoclonal antibodies that will only bind to metastatic cells. Author

**N93-25764#** State Univ. of New York, Buffalo. Dept. of Biophysical Sciences.

**EFFECT OF CYTOSKELETAL REAGENTS ON STRETCH ACTIVATED ION CHANNELS** Final Report, 15 Mar. 1989 - 14 Jun. 1992

FREDERICK SACHS 12 Nov. 1992 5 p

(Contract DAAL03-89-K-0064)

(AD-A261089; ARO-26099.9-LS) Avail: CASI HC A01/MF A01

Mechanically sensitive ion channels have been proposed to respond to membrane tension. We have developed methods to measure the membrane tension in a patch and have examined the stress-strain relationship. The results show that, in general, tension is the critical variable. However, we have also found one channel in glial cells whose gating is additionally dependent upon the curvature of the membrane. Stresses in a patch caused by suction lead to lipid flow along the wall of the pipette, but the flow is constrained by the highly extensible cytoskeleton whose area elastic constant is ca. 50 dyn/cm. We developed tools to use high voltage electron microscopy to study the structure of patches and have characterized the placement of cytoskeleton, lipids, and receptors in a variety of preparations. We also developed a new algorithm to align projections for tomography in order to examine the three-dimensional structure of patches. We have demonstrated mechanically induced release of calcium via stretch-activated ion channels in heart cells extending work on the molecular level to the whole cell level.

DTIC

**N93-25877#** Corvallis Environmental Research Lab., OR.  
**ANATOMY AND PHYSIOLOGY OF PLANT CONDUCTIVE SYSTEMS**

CRAIG MCFARLANE, ed. and S. TRAPP, ed. 1993 42 p  
Repr. from *Modeling Anthropogenic Organic Chemicals in Plants* (New York), Marcel Dekker Publishing Corp., 1993

(PB93-156032; EPA/600/A-93/017) Avail: CASI HC A03/MF A01

Mathematical models considered in the book are representations of the physical features and chemical reactions that define interactions between plants and their environment. By centering attention on equations, it is easy to lose sight of the intricate and complex nature of the problem. The particular chapter describes the anatomy of important plant features and briefly discusses some physiological principles that will help to visualize and perceive the conditions which are represented in the models. Because of the many competing interactions, the fate of chemicals in the soil/plant/air environment is not obvious. Models were thus developed to intelligently integrate available knowledge, to increase understanding of the complex interactions, to aid in presentation of plant functions, and to help make predictions about chemical fate.

NTIS

**N93-25994\*** National Aeronautics and Space Administration. Pasadena Office, CA.

**PSEUDOMONAS SCREENING ASSAY** Patent

RUTH MARGALIT, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 11 May 1993 4 p Filed 30 Mar. 1990 Supersedes N90-27239 (29 - 21, p 3032)

(NASA-CASE-NPO-17653-1-CU; US-PATENT-5,210,019;

US-PATENT-APPL-SN-501908; US-PATENT-CLASS-435-7.32;

US-PATENT-CLASS-435-7.92; US-PATENT-CLASS-435-874;

US-PATENT-CLASS-436-518; INT-PATENT-CLASS-G01N-33/569)

Avail: US Patent and Trademark Office

A method for the detection of *Pseudomonas* bacteria is described where an Azurin-specific antibody is employed for detecting the presence of Azurin in a test sample. The detection of the presence of Azurin in the sample is a conclusive indicator of the presence of the *Pseudomonas* bacteria since the Azurin protein is a specific marker for this bacterial strain.

Official Gazette of the U.S. Patent and Trademark Office

**N93-26066\*#** Houston Univ., TX. Dept. of Biological and Environmental Sciences.

**METABOLIC RESPONSE OF ENVIRONMENTALLY ISOLATED MICROORGANISMS TO INDUSTRIAL EFFLUENTS: USE OF A NEWLY DESCRIBED CELL CULTURE ASSAY** Final Report

ROBERT N. FEREBEE /in NASA. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1992, Volume 1 10 p 15 Sep. 1992

Avail: CASI HC A02/MF A02

An environmental application using a microtiter culture assay to measure the metabolic sensitivity of microorganisms to petrochemical effluents will be tested. The Biomedical Operations and Research Branch at NASA JSC has recently developed a rapid and nondestructive method to measure cell growth and metabolism. Using a colorimetric procedure the uniquely modified assay allows the metabolic kinetics of prokaryotic and eukaryotic cells to be measured. Use of such an assay if adapted for the routine monitoring of waste products, process effluents, and environmentally hazardous substances may prove to be invaluable to the industrial community. The microtiter method as described will be tested using microorganisms isolated from the Galveston Bay aquatic habitat. The microbial isolates will be identified prior to testing using the automated systems available at JSC. Sodium dodecyl sulfate (SDS), cadmium, and lead will provide control toxic chemicals. The toxicity of industrial effluent from two industrial sites will be tested. An effort will be made to test the efficacy of this assay for measuring toxicity in a mixed culture community.

Author

**N93-26069\*#** University of Western Illinois, Macomb. Dept. of Mathematics.

**ANALYSIS OF THE LETTUCE DATA FROM THE VARIABLE PRESSURE GROWTH CHAMBER AT NASA JOHNSON SPACE CENTER: A THREE-STAGE NESTED DESIGN MODEL** Final Report

TZE-SAN LEE /in NASA. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1992, Volume 1 14 p Dec. 1992

(Contract NGT-44-005-803)

Avail: CASI HC A03/MF A02

A model of three-stage nested experimental design was applied to analyze the lettuce data obtained from the variable pressure growth chamber test bed at NASA-Johnson Space Center. From the results of an application of the analysis of variance and covariance on the data set, it was noted that all of the (uncontrollable) factors, Side, Zone, Height and (controllable) PAR (photosynthetically active radiation), had nonhomogeneous effects on the dry weight of the edible biomass of lettuce per pot. Incidentally, the variations accountable to the (uncontrollable) factorial heterogeneities are merely 9 percent and 17 percent of the total variation for both the first and second crop test, respectively. After adjusting for the PAR as a covariate in the no-intercept model, the accountable variations to all the four factors are 94 percent and 92 percent for the first and the second crop test, respectively. With the use of a no-intercept simple linear regression model, the accountable variations to the factor PAR are 92 percent and 90 percent for the first and the second crop test, respectively. Evidently, the (controllable) factor PAR is the dominating one.

Author

**N93-26073\*#** Mercer Univ., Macon, GA. Dept. of Electrical and Computer Engineering.

**INVESTIGATION INTO THE COMMON MODE REJECTION RATIO OF THE PHYSIOLOGICAL SIGNAL CONDITIONER CIRCUIT** Final Report

EDWARD M. OBRIEN /in NASA. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1992, Volume 2 10 p Dec. 1992

(Contract NGT-44-005-803)

Avail: CASI HC A02/MF A02

The common mode rejection ratio (CMRR) of the single operational amplifier (op amp) differential amplifier and of the three operational amplifier differential amplifier was investigated. The three op amp differential amplifier circuit is used in the signal conditioner circuit which amplifies signals such as the electromyograph or electrocardiogram. The investigation confirmed via SPICE modeling what has been observed by others in the recent literature that the CMRR for the circuit can be maximized without precision resistor values or precisely matched op amps. This can be done if one resistor in the final stage can be adjusted either by a potentiometer or by laser trimming in the case of hybrid circuit fabrication. Author

**N93-26077\*** Louisiana Tech Univ., Ruston. Dept. of Health and Physical Education.

**UTILIZATION OF THE GRADED UNIVERSAL TESTING SYSTEM TO INCREASE THE EFFICIENCY FOR ASSESSING AEROBIC AND ANAEROBIC CAPACITY Final Report**

SANDRA L. RODGERS /n NASA. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1992, Volume 2 9 p Dec. 1992 (Contract NGT-44-005-803) Avail: CASI HC A02/MF A02

The in-flight exercise test performed by cosmonauts as part of the Russian Exercise Countermeasure Program is limited to 5 minutes due to communication restrictions. During a recent graded exercise test on a U.S. Shuttle flight, the test was terminated early due to an upcoming loss of signal (LOS) with the ground. This exercise test was a traditional test where the subject's exercise capacity dictates the length of the test. For example, one crew member may take 15 minutes to complete the test, while another may take 18 minutes. The traditional exercise test limits the flight schedulers to large blocks of space flight time in order to provide medical and research personnel information on the fitness capacity (maximal oxygen uptake:  $VO_{2max}$ ) of crew members during flight. A graded exercise test that would take a finite amount of time and a set preparation and recovery time would ease this problem by allowing flight schedulers to plan exercise tests in advance of LOS. The Graded Universal Testing System (GUTS) was designed to meet this goal. Fitness testing of astronauts before and after flight provides pertinent data on many variables. The Detailed Supplemental Objective (DSO608) protocol (6) is one of the graded exercise tests (GXT) currently used in astronaut testing before and after flight. Test times for this protocol have lasted from 11 to 18 minutes. Anaerobic capacity is an important variable that is currently not being evaluated before and after flight. Recent reports (1,2,5) from the literature have suggested that the oxygen deficit at supramaximal exercise is a measure of anaerobic capacity. We postulated that the oxygen deficit at maximal exercise would be an indication of anaerobic capacity. If this postulate can be accepted, then the efficiency of acquiring data from a graded exercise test would increase at least twofold. To examine this hypothesis anaerobic capacity was measured using a modified treadmill test (3,4) designed to exhaust the anaerobic systems in approximately 45 to 75 seconds. Lactate concentration in the blood was analyzed after all tests, since lactate is the end-product of anaerobic energy production. Therefore, the peak lactate response is an additional indication of anaerobic capacity. A preliminary comparison of the GUTS and the DSO608 suggests that the GUTS protocol would increase the efficiency of  $VO_{2max}$  testing of astronauts before and after flight. Results for anaerobic capacity have not been tabulated. Author

**N93-26259\*** Trinity Univ., San Antonio, TX.  
**EFFECTS OF SPACE RADIATION ON HUMORAL AND CELLULAR IMMUNITY IN RHESUS MONKEYS Final Report, May 1990 - Mar. 1991**

WILLIAM H. STONE and MICHAEL L. MILLER (Childrens Memorial Hospital, Chicago, IL.) Dec. 1992 21 p (Contract F33615-87-D-0626) (AD-A261808; AL-TR-1992-0101) Avail: CASI HC A03/MF A01

The objective of this study was to complete profiles of immune

competence in rhesus monkeys more than 25 years after single exposures to protons of different energies. Access to irradiated animals provided a unique opportunity to study late effects on the immune systems of nonhuman primates; late immunological defects could be relevant to astronauts and high-flying pilots. Working with the primate model allowed us to assess the possible late effects of ionizing radiations on parameters associated with B-cell and T-cell functions. Antibody-mediated immune (AMI) function was investigated by measuring immunoglobulin (Ig) levels, hemolytic complement activity, and autoantibodies. Cell-mediated immune (CMI) function was evaluated by measuring selected T- and B-cell activities as well as responses to mitogens and interleukin production. There were no significant differences between control and irradiated animals for most parameters measured in this survey, but some reduction in spontaneous proliferation was noted in irradiated primates. With regard to late risks for humans following exposure(s) to ionizing radiations, it is encouraging that few late immunobiological effects were exhibited by primate survivors of low and intermediate doses of protons. DTIC

**N93-26587\*** Oak Ridge National Lab., TN.  
**DEVELOPMENT OF RESONANCE IONIZATION SPECTROSCOPY FOR GENOME MAPPING AND DNA SEQUENCING USING STABLE ISOTOPES AS DNA LABELS**

K. B. JACOBSON, M. J. DOKTYCZ, R. A. SACHLEBEN, G. M. BROWN, F. W. LARIMER, and H. F. ARLINGHAUS (Atom Sciences, Inc., Oak Ridge, TN.) 1993 10 p Presented at the International Society for Optical Engineering (SPIE) Conference, Los Angeles, CA, 16-23 Jan. 1993

(Contract DE-AC05-84OR-21400; DE-FG05-91ER-81235)

(DE93-007815; CONF-930159-16) Avail: CASI HC A02/MF A01

Stable isotopes can be used as alternatives to radioisotopes or fluorescent DNA labels. After the labeled DNA has been banded on electrophoresis gels, the stable isotopes may be located by scanning the gel with resonance ionization spectroscopy. Methods for synthesizing appropriate labels and for detecting isotopes of iron and tin directly on polyacrylamide gels are described. DOE

**N93-26700\*** General Electric Co., Houston, TX. Government Services.

**SPACE STATION FREEDOM BIOMEDICAL MONITORING AND COUNTERMEASURES: BIOMEDICAL FACILITY HARDWARE CATALOG**

15 Jun. 1990 183 p Sponsored by NASA. Lyndon B. Johnson Space Center (NASA-CR-193156; NAS 1.26:193156; LS-35001) Avail: CASI HC A09/MF A02

This hardware catalog covers that hardware proposed under the Biomedical Monitoring and Countermeasures Development Program supported by the Johnson Space Center. The hardware items are listed separately by item, and are in alphabetical order. Each hardware item specification consists of four pages. The first page describes background information with an illustration, definition and a history/design status. The second page identifies the general specifications, performance, rack interface requirements, problems, issues, concerns, physical description, and functional description. The level of hardware design reliability is also identified under the maintainability and reliability category. The third page specifies the mechanical design guidelines and assumptions. Described are the material types and weights, modules, and construction methods. Also described is an estimation of percentage of construction which utilizes a particular method, and the percentage of required new mechanical design is documented. The fourth page analyzes the electronics, the scope of design effort, and the software requirements. Electronics are described by percentages of component types and new design. The design effort, as well as, the software requirements are identified and categorized. Author

**N93-27085\*** Case Western Reserve Univ., Cleveland, OH.  
**SHAPE OPTIMIZATION OF TIBIAL PROSTHESIS COMPONENTS**

D. A. SARAVANOS, P. J. MRAZ, and D. T. DAVY Apr. 1993



33 p

(Contract NAG3-1027; RTOP 141-20-0F)  
(NASA-CR-191123; E-7815; NAS 1.26:191123) Avail: CASI HC  
A03/MF A01

NASA technology and optimal design methodologies originally developed for the optimization of composite structures (engine blades) are adapted and applied to the optimization of orthopaedic knee implants. A method is developed enabling the shape tailoring of the tibial components of a total knee replacement implant for optimal interaction within the environment of the tibia. The shape of the implant components are optimized such that the stresses in the bone are favorably controlled to minimize bone degradation, to improve the mechanical integrity of the implant/interface/bone system, and to prevent failures of the implant components. A pilot tailoring system is developed and the feasibility of the concept is demonstrated and evaluated. The methodology and evolution of the existing aerospace technology from which this pilot optimization code was developed is also presented and discussed. Both symmetric and unsymmetric in-plane loading conditions are investigated. The results of the optimization process indicate a trend toward wider and tapered posts as well as thicker backing trays. Unique component geometries were obtained for the different load cases.

Author

## 52

## AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

A93-35207

**INVESTIGATION OF FLUID-ELECTROLYTE METABOLISM AND ITS HORMONAL REGULATION DURING THE SECOND JOINT SOVIET-FRENCH SPACE MISSION [ISSLEDOVNAIE VODNO-SOLEVOGO OBMENA I EGO GORMONAL'NOI REGULIATSII VO VTOROM SOVMESTNOM SOVETSKO-FRANTSUZSKOM KOSMICHESKOM POLETE]**

A. I. GRIGOR'EV, V. B. NOSKOV, V. V. POLIAKOV, I. V. SUKHANOV, C. GHARIB, G. GAUQUELINE, C. HELEN, R. KWETNANSKI, and L. MACHO. *Aviakosmicheskaja i Ekologicheskaja Meditsina* (ISSN 0233-528X) vol. 26, no. 1 Jan.-Feb. 1992 p. 36-39. In Russian. refs  
Copyright

Minilab experiments conducted during the joint Soviet, French, and Czechoslovakian mission onboard the Mir station aimed at evaluating fluid-electrolyte metabolism and its hormonal regulation at different flight stages and early postflight are described. Blood tests were carried out on 9th and 20th days, and urine samples were collected on the 5th and 19th days in a zero-gravity environment. Frozen, postflight samples were analyzed in the laboratory. Results show that in-flight urinary fluid and sodium excretion decreased by 25-35 percent. Vasopressin blood plasma levels increased by 450 percent on the 9th day and by 700 percent on the 20th day of the mission as opposed to control levels. Blood aldosterone increased with an increase of renal excretion of both hormones. The blood plasma renin activity increased by a factor of two, and the atrionatriuretic factor did not differ from the control value. In-flight circulating plasma volume decreased by 20 percent.

O.G.

A93-35208

**CARDIAC BIOELECTRIC ACTIVITY IN HEALTHY MEN DURING A 370-DAY HEAD-DOWN TILT EXPERIMENT [BIOELEKTRICHESKAIA AKTIVNOST' SERDTSA ZDOROVYKH MUZHCHIN V USLOVIAKH 370-SUTOCHNOI ANTIORTOSTATICHESKOI GIPOKINEZII]**

V. D. TURBASOV, N. P. ARTAMONOVA, Z. A. GOLUBCHIKOVA, G. P. SAIKINA, E. I. NECHAEVA, and L. V. ANTONENKO

*Aviakosmicheskaja i Ekologicheskaja Meditsina* (ISSN 0233-528X) vol. 26, no. 1 Jan.-Feb. 1992 p. 39-41. In Russian. refs  
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In a 370-day head-down tilt (HDT) experiment nine healthy men, aged from 27 to 42 yrs, were divided into groups to examine their cardiac bioelectric activity. Countermeasures involving exercises and pharmacological means were used for four test subjects of group A, under bedrest, to control metabolism, bone tissue, and digestive function. In group B, five subjects were subjected to head-down tilt for 120 days, without any countermeasures, and then they did physical exercises. The EKG changes in group A were negligible and were manifested mainly as moderately decreased T-wave amplitudes. Group B subjects exhibited negative dynamics at early HDT stages: an elevated heart rate at rest, an increased time of atrioventricular transmission, and decreased T-wave amplitudes. In a rehabilitation period both groups exhibited a certain decrease in T-wave amplitudes. It is concluded that the HDT experiment showed a moderately adverse effect on myocardium metabolism and heart rate control mainly in group B.

O.G.

A93-35209

**INVESTIGATION OF HEMODYNAMICS AND SYMPHETICADRENAL SYSTEM ACTIVITY IN AIR TRAFFIC CONTROLLERS DURING THEIR WORK [ISSLEDOVANIE GEMODINAMIKI I AKTIVNOSTI SIMPATIKO-ADRENALOVOI SISTEMY U AVIADISPETCHEROV VO VREMIA IKH PROFESSIONAL'NOI DEIATEL'NOSTI]**

E. L. KAN, V. A. KUPRIANOV, and E. A. TSIMBALISTOVA. *Aviakosmicheskaja i Ekologicheskaja Meditsina* (ISSN 0233-528X) vol. 26, no. 1 Jan.-Feb. 1992 p. 41-43. In Russian. refs  
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The circulation and catecholamine excretion in air traffic controllers operating in two shifts (from 8 A.M. to 2 P.M. and from 2 P.M. to 9 P.M.) were assessed. It is shown that the pattern correlating parameters under consideration changed significantly depending on the work schedule. Hormonal and mediator components of the sympatheticoadrenal system depend on hemodynamic shifts, and catecholamine affects the cardiovascular activity.

O.G.

A93-35214

**HUMAN BIORHYTHMS FOLLOWING INTERREGIONAL TRAVEL (WITH REFERENCE TO NOVOSIBIRSK-VLADIVOSTOK FLIGHTS) [BIORITMY CHELOVEKA POSLE MEZHREGIONAL'NYKH PEREMESHCHENII /NA PRIMERE PERELETOV NOVOSIBIRSK-VLADIVOSTOK/]**

A. M. PICHKUROV, N. V. VOL'F, A. A. PUTILOV, S. G. KRIVOSHCHIEKOV, and A. I. TATAUROV. *Aviakosmicheskaja i Ekologicheskaja Meditsina* (ISSN 0233-528X) vol. 26, no. 1 Jan.-Feb. 1992 p. 61, 62. In Russian. refs  
Copyright

Physiological adaptation to a 3-hour shift during a roundtrip Novosibirsk-Vladivostok flight was studied. The daytime dynamics of temperature, heart rate, and breathing rate was studied in 12 healthy men, 25 to 45 years old. It is found that physiological and psychophysiological adaptation to a 3-hour shift is asymmetrical.

O.G.

A93-35216

**THE ROLE OF ULTRAVIOLET RADIATION AND VITAMIN-D METABOLISM IN MEDICAL CARE DURING SPACE FLIGHTS [ROL' UL'TRAIOLETOVOI RADIATSII I OBMENA VITAMINA D PRI MEDITSINSKOM OBESPECHENII KOSMICHESKIKH POLETOV]**

M. S. BELAKOVSKII, I. V. ANISIMOVA, and N. E. PANFEROVA. *Aviakosmicheskaja i Ekologicheskaja Meditsina* (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 4-6. In Russian. refs  
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Data on the development of UV deficiency in cosmonauts are analyzed. Attention is given to possible ways to optimize the UV

radiation and the alimentary stearin supply in order to prevent vitamin-D deficiency and to correct changes in the phosphorus-calcium metabolism. AIAA

A93-35219

**THE CHARACTER OF SPONTANEOUS OCULOMOTOR ACTIVITY IN WEIGHTLESSNESS AND DURING READAPTATION [KHARAKTER SPONTANNOI GLAZODVIGATEL'NOI AKTIVNOSTI V USLOVIAKH NEVESOMOSTI I V PERIOD READAPTATSII]**

L. N. KORNIOVA, A. M. GONCHARENKO, V. GRIGOROVA, and A. MANEV Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 15-22. In Russian. refs Copyright

The paper presents results of the Soviet-Bulgarian experiment Labyrinth on spontaneous oculomotor activity conducted with the participation of five cosmonauts prior to and after 10-day and 241-day flights. It was found that, in the first three days of space flight, there was an increase in the spontaneous activity of 'swimming' and saccadic type or spontaneous nystagmus, mainly in the vertical direction. AIAA

A93-35221

**HEMODYNAMIC STATUS OF HUMANS DURING A GRADED ORTHOSTATIC TEST [SOSTOIANIE GEMODINAMIKI CHELOVEKA PRI PROVEDENII ORTOSTATICHESKOI PROBY V STUPENCHATOM REZHIME]**

A. IU. MODIN and V. S. SHASHKOV Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 26-29. In Russian. refs Copyright

Fourteen volunteers were exposed to a graded orthostatic test involving a passive tilt from the horizontal position (0 deg) to an orthostatic posture (70 deg) with intermediate angles of 10, 20, 30, 40, 50, and 60 deg; each position was maintained for 5 min. It is concluded that the set of parameters measured becomes more informative if the test is performed in a graded manner since in this case it is possible to assess the order and magnitude of passive and active hemodynamic changes, and, on the basis of their comparison, to evaluate the adequacy of compensatory circulatory responses to orthostatic exposure. AIAA

A93-35222

**INFORMATIVE VALUE OF THE RERESPIRATION METHOD FOR EVALUATING THE FUNCTIONAL RESOURCES OF THE CARDIORESPIRATORY SYSTEM DURING THE SIMULATION OF CERTAIN FLIGHT FACTORS [INFORMATIVNOST' METODA RERESPIRATSII PRI OTSENKE FUNKTSIONAL'NYKH REZERVOV KARDIORESPIRATORNOI SISTEMY V USLOVIAKH MODELIROVANIYA NEKOTORYKH FAKTOROV POLETA]**

A. S. NEKHAEV, IU. I. ANDRIENKO, and N. N. SAVOST'IANOVA Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 32-35. In Russian. refs Copyright

The paper presents an investigation of the informative value of the recurrent breathing (rerespiration) method for evaluating the functional status of the human body during recovery after exposure to noise and vibration, to piloting accelerations, and to head-down hypokinesia. It is demonstrated that a 1.5-h exposure to noise and vibration increases the tolerance to respiration, suggesting a stimulation effect. Piloting head-to-seat accelerations of 7 to 9 G are connected with a reduction in tolerance to rerespiration, the functional status being recovered 1 day later. After 30-day head-down hypokinesia, there is a reduction in the respiration tolerance, both in subject with drug correction and in the control group. AIAA

A93-35223

**EQUIVALENT DOSE OF COSMIC RAYS AT REPRESENTATIVE POINTS OF HUMAN-BODY MODELS [EKVIVALENTNAIA DOZA KOSMICHESKIKH LUCHEI V PREDSTAVITEL'NYKH TOCHKAKH MODELEI TELA CHELOVEKA]**

G. V. KRASIL'NIKOV, L. A. PEROVA, and V. M. SAKHAROV Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 35-42. In Russian. refs Copyright

Equivalent doses of cosmic-ray protons were investigated in a wide range of spectra (characterizing solar cosmic rays and the earth's radiation belts) for three standardized models of the human body. The shielding functions of representative points of an anthropometric model were calculated, and equivalent dose values in various models were compared. It was shown that representative points of the central nervous and hemopoietic systems in a spherical model of the human body did not yield correlated values of equivalent dose as compared to more rigorous models. AIAA

A93-35226

**SIGNIFICANCE OF A COMPARISON OF RESULTS OF CALORIC AND VESTIBULOMETRIC ROTATION TESTS [ZNACHENIE SOPOSTAVLENIIA REZUL'TATOV KALORICHESKIKH I VRASHCHATEL'NYKH VESTIBULOMETRICHESKIKH TESTOV]**

M. M. LEVASHOV, S. V. LILENKO, and E. P. MASLOVA Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 51-55. In Russian. refs Copyright

The use of modified, less laborious, easier-to-tolerate vestibulometric tests facilitated the diagnosis of Meniere's disease and neurinomas of the vestibular nerve. A comparison of nystagmometric findings obtained for the same patient during caloric and rotation tests using the bithermal-test diagnostic model made it possible to clarify the mechanisms for nystagmogenesis associated with pathological states in the ear labyrinth and the vestibular portion of the craniocerebral nerve. AIAA

A93-35227

**AGE AND LENGTH OF SERVICE OF FLIGHT PERSONNEL IN THE CASE OF CHRONIC DISEASES [VOZRAST I DLITEL'NOST' LETNOI RABOTY PRI KHRONICHESKIKH ZABOLEVANIYAKH]**

V. V. VLASOV Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 55-57. In Russian. refs Copyright

Cases of chronic diseases have been investigated for 1433 pilots and navigators. The length of service of the personnel after the occurrence of the disease was found to follow a bimodal distribution. The first peak coincides with the time of the initially diagnosed illness, while the second, delayed peak in older individuals approximates the first one. Thus, for persons who had a chronic disease initially diagnosed when they were 20 years old, this diagnosis was confirmed in 18 to 20 years, while in persons who were 35 when the disease was initially diagnosed, the diagnosis was confirmed in 2 to 4 years. AIAA

A93-35228

**VALIDATION OF THE USE OF THE HELIUM-NEON LASER IN THE MEDICAL REHABILITATION OF PATIENTS WITH ATROPHY [OBOSNOVANIYE PRIMENENIYA GELII-NEONOVOGO LAZERA V MEDITSINSKOI REABILITATSII BOL'NYKH S ATROFIAMI]**

I. Z. NEMTSEV, S. D. ZAKHAROV, V. P. LAPSHIN, L. L. STAZHADZE, O. N. MENCHUKOV, S. N. PEROV, A. V. IVANOV, N. A. PANASENKO, and A. V. ARMICHEV Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 57-62. In Russian. refs Copyright

He-Ne-laser radiation at a wavelength of 0.633 micron was used for the rehabilitation of 15 patients with muscular atrophy resulting from the wearing of immobilizing plaster armbraces on

lower-extremity fractures. Fifty-day hypokinesia of a damaged extremity induced differences in functional indices between damaged and healthy extremities in the same patient. This difference was found to diminish more rapidly after laser therapy than in the control group, though all patients had adequate rehabilitative treatment. AIAA

#### A93-35230

##### **RADIATION CONDITIONS ONBOARD PASSENGER AIRCRAFT [RADIATIONNYE USLOVIA NA BORTU PASSAZHIRSKIKH SAMOLETOV]**

V. P. SUSLIN Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 73, 74. In Russian. refs  
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Experiments were conducted to evaluate the formation of the effective equivalent radiation dose on civil-aviation flight personnel. Dosimetric measurements of the photon component of cosmic rays were performed onboard the Russian passenger aircraft IL-86 and TU-154-B-2, flying over common air routes. The results obtained can be used to develop radiation-protection measures for flight personnel. AIAA

#### A93-35231

##### **SOME FEATURES CHARACTERIZING THE SUPPLY OF ASTRONAUTS WITH VITAMINS C, B1, B2, AND B6 DURING NOURISHMENT FROM CANNED-FOOD RATIONS ON LONG-TERM SPACE FLIGHTS [NEKOTORYE OSOBENNOSTI OBESPECHENIIA VITAMINAMI C, B1, B2, I B6 PRI PITANII RATSIONAMI IZ KONSERVIROVANNYKH PRODUKTOV PRIMENITEL'NO K DLITEL'NYM POLETAM CHELOVEKA]**

I. G. POPOV and V. A. KORSHUNOVA Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 74-79. In Russian. refs  
Copyright

The paper presents results on the supply of human subjects with vitamins C, B1, B2, and B6 in the case of nourishment from canned-food rations with the addition of a polyvitamin supplement and without this supplement. It is shown that the daily ingestion of the supplement led to a relatively fast normalization of supply with vitamins C, B1, and B6. AIAA

#### A93-35234

##### **DATA BANK ESTABLISHMENT PRINCIPLES AS APPLIED TO THE PROBLEM OF PHYSIOLOGICAL NORMS IN SPACE MEDICINE [PRINTSIPI POSTROENIIA BANKA DANNYKH PRIMENITEL'NO K PROBLEME FIZIOLOGICHESKOI NORMY V KOSMICHESKOI MEDITSINE]**

A. I. GRIGOR'EV, R. M. BAEVSKII, V. V. OVCHINNIKOV, E. N. SVETAILLO, and T. D. SEMENOVA Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 25-31. In Russian. refs  
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The use of a data bank to determine the maximum normal ranges of physiological indices in cosmonauts at various stages of flight training and during flights is examined. A classification of functional states based on the concepts of adaptation and homeostasis is proposed. Various approaches to determining a norm are described. Three types of norms which are of significance for space medicine, namely, rest norm, reaction norm, and adaptive norm, are identified. The structure of a data bank containing information on standards is described. The central data bank structure is also considered. AIAA

#### A93-35236

##### **METHODOLOGY FOR CLINICAL TESTING OF ANTIRADIATION MEANS INTENDED FOR MANNED SPACE FLIGHT CONDITIONS [METODOLOGIIA KLINICHESKIKH ISPYTANII PROTIVOLUCHEVYKH SREDSTV, PREDNAZNACHENNYKH DLIA USLOVII PILOTIRUEMYKH KOSMICHESKIKH POLETOV]**

V. I. EFIMOV Aviakosmicheskaya i Ekologicheskaya Meditsina

(ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 35-37. In Russian. refs  
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Methods for clinical testing of antiradiation measures to be used in manned space missions are proposed and discussed. The tests should be based on: individual tolerance to a recommended medicinal form of the drug; tolerances to the effects of motion sickness and prolonged transverse and longitudinal accelerations; graded physical exercise; and evaluation of performance (operator activity). AIAA

#### A93-35238

##### **FUNCTIONAL STATE OF THE CARDIOVASCULAR SYSTEM OF THE COSMONAUTS OF THE SIXTH PRIMARY MISSION ON THE MIR STATION [FUNKTSIONAL'NOE SOSTOYANIE SERDECHNO-SOSUDISTOI SISTEMY U KOSMONAVTOV SHESTOI OSNOVNOI EKSPEDITSII NA STANTSII 'MIR']**

V. V. POLIAKOV, O. D. ANASHKIN, I. V. ALFEROVA, V. F. TURCHANINOVA, Z. A. GOLUBCHIKOVA, A. P. POLIAKOVA, V. R. LIAMIN, V. D. TURBASOV, V. M. NALIZHITYI, and A. P. KULEV Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 48-52. In Russian.

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Medical results of inflight cardiovascular measurements made on the sixth primary mission at rest and during provocative graded bicycle exercises and LBNP tests are presented. Electrocardiography, tetrapolar rheography, kinetocardiography, arteriovenous pulsography, and tachoscoligraphy were used to examine the cosmonauts. Together with the usual cardiovascular changes typical of the microgravity effect, individual features of the development of the control mechanisms are noted. In one of the cosmonauts a number of symptoms responsible for a decreased venous return are observed. Generally speaking, the functional state of the cardiovascular system at all flight stages was characterized by a sufficiently high physiological level. AIAA

#### A93-35243

##### **PROTEIN COMPOSITION OF THE BLOOD PLASMA OF COSMONAUTS AFTER LENGTHY ORBITAL FLIGHTS [BELKOVIYI SOSTAV PLAZMY KROVI KOSMONAVTOV POSLE DLITEL'NYKH ORBITAL'NYKH POLETOV]**

O. N. LARINA Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 67-69. In Russian. refs

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The method of 2D electrophoresis is used to determine the protein composition of the blood plasma in cosmonauts on board the Mir station over periods of 166 and 366 d. The separation pattern of the plasma protein observed the day after landing exhibited several typical differences from the standard pattern of plasmatic proteins found during the preflight examination and on the seventh postflight day. The changes were an increase in the intensity of specific protein spots and also in the occurrence of unusual protein spots. AIAA

#### A93-35244

##### **EFFICIENCY OF USING ITERATIVE HYPOXIC HYPERCAPNIC STIMULI FOR ENHANCING CARDIORESPIRATORY RESERVES UNDER THE EFFECT OF RADIAL ACCELERATIONS [EFFEKTIVNOST' ISPOL'ZOVANIIA POVTORNYKH GIPOKSICHESKO-GIPERKAPNICHESKIKH STIMULOV DLIA POVYSHENIIA KARDIORESPIRATORNYKH REZERVOV PRI VOZDEISTVII RADIAL'NYKH USKORENIY]**

IU. I. ANDRIENKO, A. S. NEKHAEV, and N. N. SAVOST'YANOVA Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 71, 72. In Russian. refs  
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The possibility of using rerespiration in a training mode for enhancing the body's stability under the effect of extreme factors of flight activity is examined. During 20-25 d of centrifuge testing with six healthy men aged 19-22 yr, the Fiziolog M 1 apparatus measured one-minute breathing volume, breathing frequency, and

vascular contraction frequency. The reserve potential of the cardiorespiratory system in the appropriate time interval of respiration after a workout cycle was found to be higher after the training cycle than before it. For the case of repeat rotations on the centrifuge, the overload endurance level increased by an average of 0.6 unit. AIAA

A93-35245

**AUTOROSETTE FORMATION IN THE PERIPHERAL BLOOD OF PEOPLE WITH LENGTHY LIMITATIONS OF MOTOR ACTIVITY [AUTOROZETKOOBRAZOVANIE V PERIFERICHESKOI KROVI LIUDEI PRI DLITEL'NOM OGRANICHENII DVIGATEL'NOI AKTIVNOSTI]**

D. I. BEL'CHENKO and A. M. TEBEN'KOV Aviakosmicheskaja i Ekologicheskaja Meditsina (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 72-75. In Russian. refs Copyright

Results of an investigation of the blood of people forced to spend lengthy periods of limited motor activity due to bone fractures are presented. On the basis of blood smears of two groups of patients hospitalized with neck and hip fractures, respectively, it is argued that, since phenomena of the destruction of erythrocytes were observed in the zone of their contact with mononuclears, erythrocyte destruction was the result of the interaction of the cells comprising the autorosettes. AIAA

A93-35247

**MICROWAVES AND THE VISUAL ANALYZER [MIKROVOLNYI ZRITEL'NYI ANALIZATOR]**

V. G. ZUEV, S. V. LOGVINOV, A. I. RYZHOV, V. S. TIKHONCHUK, and I. B. USHAKOV Aviakosmicheskaja i Ekologicheskaja Meditsina (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 4-8. In Russian. refs Copyright

Results of a study of the effect of microwaves on different regions of the eye's visual analyzer are presented. Morphofunctional changes at the light-optic and electron microscopic levels are revealed which involve not only the peripheral area of the visual analyzer but also its central regions. Some epidemiological observations are indicative of altered sizes of the blind spot, reduced magnitudes of optic rheobase and chronaxy, color vision disorder, and increased diastolic pressure in the central artery of the retina. AIAA

A93-35250

**AGE-RELATED CHANGES IN HEMOGLOBIN AND ERYTHROCYTE LEVELS [VOZRASTNYE IZMENENIIA KONTSENTRATSII GEMOGLOBINA I ERITROTSITOV U LETCHIKOV]**

V. V. VLASOV Aviakosmicheskaja i Ekologicheskaja Meditsina (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 19-23. In Russian. refs Copyright

A longitudinal study conducted over a period of ten years on subjects 20 to 45 years of age has revealed changes in the health of 706 pilots and air navigators and in the hemoglobin (Hb) and erythrocyte levels in the peripheral blood. The Hb concentration was found to increase with an increase in age. Over the 20-30-yr age range, this parameter is lower in persons who have been healthy for a long time. It was also found that a high level of Hb and a high mean concentration of Hb in the erythrocytes have an adverse effect on health and flight fitness. AIAA

A93-35252

**FEATURES OF AN ETHANOL EFFECT IN OPERATORS WITH DIFFERENT STATES OF SKIN TISSUE BASOPHILS [OSOBENNOSTI DEISTVIA ETANOLA U OPERATOROV S RAZNYM SOSTOIANIEM TKANEVYKH BAZOFILOV KOZHII]**

I. B. USHAKOV, V. S. TIKHONCHUK, S. M. RAZINKIN, A. N. KORDENKO, and L. V. PAKHUNOVA Aviakosmicheskaja i Ekologicheskaja Meditsina (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 27-29. In Russian. refs Copyright

Changes in certain parameters of operator activity after ethanol administration at a dose of 1.9 g/kg body weight were studied in 10 men performing the task of 2D compensatory tracking on a simulator. It was found that subjects with a low initial number of tissue basophils exhibiting signs of a holocrine-typed secretion and with a more pronounced response of these cells to ethanol were characterized by a significantly higher degree of the impairment of many parameters of operator activity. AIAA

A93-35253

**DIURNAL RHYTHMICITY OF HUMAN ORTHOSTATIC STABILITY [SUTOCHNAIA RITMICHNOST' ORTOSTATICHESKOI USTOICHIVOSTI CHELOVEKA]**

IU. V. SOROKIN, A. P. SOLOMKO, and R. M. DIMAROV Aviakosmicheskaja i Ekologicheskaja Meditsina (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 29-32. In Russian. refs Copyright

The diurnal rhythmicity of the orthostatic stability of the blood system in healthy mean was studied on the basis of an orthostatic test performed six times a day at four-hour intervals. The degree of changes in the cerebral blood supply intensity was found to undergo pronounced variations depending on the time of day. The day-night cyclicity of the orthostatic stability of the cerebral circulation was greatly conditioned by the biorhythm of the responses of arterial vessels of the lower extremities. The highest orthostatic stability was observed at 3-11 AM, while the lowest was observed at 3-7 PM. AIAA

A93-35254

**METABOLISM IN COSMONAUTS - RESULTS OF BIOCHEMICAL BLOOD ANALYSES FOR CREW MEMBERS OF SEVEN PRIMARY MISSIONS ON THE MIR ORBITAL STATION [OBMEN VESHCHESTV U KOSMONAVTOV - ITOGI BIOKHIMICHESKOGO ISLEDOVANIJA KROVI U CHLENOV EKIPAZHEI 7 OSNOVNYKH EKSPEDITSII NA ORBITAL'NOM KOMPLEKSE 'MIR']**

I. A. POPOVA, E. G. VETROVA, L. B. ZAITSEVA, O. N. LARINA, A. A. MARKIN, and N. IU. FEDOTOVA Aviakosmicheskaja i Ekologicheskaja Meditsina (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 35-39. In Russian. refs Copyright

Preflight and postflight biochemical analyses of the blood of 16 cosmonauts flown on the Mir station for periods of 125 to 366 days showed changes in carbohydrate, lipid, and protein metabolisms that were in line with current ideas on the effects of space flight on the human metabolism. Particular individual patterns of the response and the absence of correlations with flight durations ranging from four months to one year are noted. AIAA

A93-35255

**EFFECT OF STAYS AT MEDIUM-MOUNTAIN ALTITUDE ON THE MAINTENANCE OF THE GOOD HEALTH AND HIGH PHYSICAL WORK CAPACITY OF COSMONAUTS OVER A PROLONGED PERIOD OF TIME [VLIANIE SREDNEGOR'IA NA SOKHRANENIE KHOROSHEGO SOSTOIANIJA ZDOROV'IA I VYSOKOI FIZICHESKOI RABOTOSPOSOBNOSTI KOSMONAVTOV V TECHENIE DLITEL'NOGO VREMENI]**

A. F. ZAVADOVSKII, IU. N. VAVAKIN, and M. M. KOROTAEV Aviakosmicheskaja i Ekologicheskaja Meditsina (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 40-42. In Russian. refs Copyright

The effect of periodic (1-2 times per year) training at medium-mountain altitudes on the work capacity and health of cosmonauts was investigated. Results of 40 training sessions at altitudes from 1600 to 2400 m above sea level are reported. The physiological and physical parameters of the body (BP according to Korotkov, HR, and VO<sub>2</sub> max) measured during bicycle ergometer tests and during treadmill tests were examined before, during, and after the training sessions. After the termination of physical training the majority of the test subjects exhibited a significant decrease in HR as compared with the control value. AIAA

A93-35256

**VESTIBULO-OCULOMOTOR RESPONSES UNDER  
CONDITIONS OF IMMERSION HYPOKINESIA  
[VESTIBULO-GLAZODVIGATEL'NYE REAKTSII V USLOVIAKH  
IMMERSIONNOI GIPOKINEZII]**

L. N. KORNILOVA, O. N. KLIUSHNIKOVA, S. B. KORSUNSKII,  
and V. G. KOZLOVA Aviakosmicheskaja i Ekologicheskaja  
Meditsina (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p.  
43-47. In Russian. refs

Copyright

The paper presents results of a study of the spontaneous oculomotor responses and those induced by vestibular and visual stimulation in 30 test subjects exposed to a three-day immersion. In 30 percent of the cases examined, the exposure to immersion is shown to result in spontaneous nystagmus, to reduce the accuracy of fixed turns and tracking, and to facilitate oculomotor responses during optokinetic and optovestibular stimulation.

AIAA

A93-35257

**THE STATE OF CARDIAC ACTIVITY CONTROL IN HUMANS  
DURING CYCLIC CHANGES OF BAROMETRIC PRESSURE IN  
A HERMETIC CHAMBER [SOSTOIANIE REGULIATSII  
SERDECHNOI DEIATEL'NOSTI U CHELOVEKA PRI  
TSIKLICHESKOM IZMENENII BAROMETRICHESKOGO  
DAVLENIJA V USLOVIAKH GERMOOB'EKTA]**

V. S. NOVIKOV, I. L. MYZNIKOV, and V. N. BORTNOVSKII  
Aviakosmicheskaja i Ekologicheskaja Meditsina (ISSN 0233-528X)  
vol. 26, no. 4 July-Aug. 1992 p. 47-49. In Russian. refs

Copyright

A cyclic change of barometric pressure from 790 to 720 mm Hg from once a day to twice in three days in a hermetic chamber was shown to result in a functional rearrangement of the mechanism that controls cardiac activity, causing the predominance of vagotonic responses determined by a decrease of the reserves of the body and its astheniation. The occurrence of this effect might explain the development of stable premonitory states in operators of hermetically sealed chambers.

AIAA

A93-35493\* National Aeronautics and Space Administration.  
Lyndon B. Johnson Space Center, Houston, TX.

**BODY FLUID ALTERATIONS DURING HEAD-DOWN BED  
REST IN MEN AT MODERATE ALTITUDE**

J. A. LOEPPKY, R. C. ROACH (Lovelace Medical Foundation,  
Albuquerque, NM), M. A. SELLAND (Colorado Univ., Denver), P.  
SCOTTO (Napoli, Univ., Naples, Italy), F. C. LUFT  
(Erlangen-Nuernberg Univ., Erlangen, Germany), and U. C. LUFT  
(Lovelace Medical Foundation, Albuquerque, NM) Aviation, Space,  
and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 4  
April 1993 p. 265-274. refs

(Contract NAG9-375)

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To determine the effects of hypoxia on fluid balance responses to simulated zero-gravity, measurements were made in six subjects before and during -5 deg continuous head-down bed rest (HDBR) over 8 d at 10,678 ft. The same subjects were studied again at this altitude without HDBR as a control (CON) using a cross-over design. During this time, they maintained normal upright day-time activities, sleeping in the horizontal position at night. Fluid balance changes during HDBR in hypoxia were more pronounced than similar measurements previously reported from HDBR studies at sea level. Plasma volume loss was slightly greater and the diuresis and natriuresis were doubled in magnitude as compared to previous studies in normoxia and sustained for 4 d during hypoxia. These changes were associated with an immediate but transient rise in plasma atrial natriuretic peptide (ANP) to day 4 of 140 percent in HDBR and 41 percent in CON (p less than 0.005), followed by a decline towards baseline. Differences were less striking between HDBR and CON for plasma antidiuretic hormone and aldosterone, which were transiently reduced by HDBR. Plasma catecholamines showed a similar pattern to ANP in both HDBR and CON, suggesting that elevated ANP and catecholamines together

accounted for the enhanced fluid shifts with HDBR during hypoxia.  
Author (revised)

A93-35494\* National Aeronautics and Space Administration.  
Lyndon B. Johnson Space Center, Houston, TX.

**EFFECTS OF PROLONGED HEAD-DOWN BED REST ON  
PHYSIOLOGICAL RESPONSES TO MODERATE HYPOXIA**

J. A. LOEPPKY, R. C. ROACH (Lovelace Medical Foundation,  
Albuquerque, NM), M. A. SELLAND (Colorado Univ., Denver), P.  
SCOTTO (Napoli, Univ., Naples, Italy), E. R. GREENE, and U. C.  
LUFT (Lovelace Medical Foundation, Albuquerque, NM) Aviation,  
Space, and Environmental Medicine (ISSN 0095-6562) vol. 64,  
no. 4 April 1993 p. 275-286. refs

(Contract NAG9-375)

Copyright

To determine the effects of hypoxia on physiological responses to simulated zero-gravity cardiopulmonary and fluid balance measurements were made in 6 subjects before and during 5-degree head-down bed rest (HDBR) over 8 d at 10,678 ft and a second time at this altitude as controls (CON). The V-dot(O<sub>2</sub>)(max) increased by 9 percent after CON, but fell 3 percent after HDBR. This reduction in work capacity during HDBR could be accounted for by inactivity. The heart rate response to a head-up tilt was greatly enhanced following HDBR, while mean blood pressure was lower. No significant negative impact of HDBR was noted on the ability to acclimatize to hypoxia in terms of pulmonary mechanics, gas exchange, circulatory or mental function measurements. No evidence of pulmonary interstitial edema or congestion was noted during HDBR at the lower P<sub>IO2</sub> and blood rheology properties were not negatively altered. Symptoms of altitude illness were more prevalent, but not marked, during HDBR and arterial blood gases and oxygenation were not seriously effected by simulated microgravity. Declines in base excess with altitude were similar in both conditions. The study demonstrated a minimal effect of HDBR on the ability to adjust to this level of hypoxia. Author (revised)

A93-35495

**EFFECTS OF 28-DAY ISOLATION (ESA-ISEMSI'90) ON BLOOD  
PRESSURE AND BLOOD VOLUME REGULATING HORMONES**

ALAIN MAILLET (Lyon I, Univ., France), HANS C. GUNGA (Berlin,  
Free Univ., Germany), GUILLEMETTE GAUQUELIN, JACQUES O.  
FORTRAT (Lyon I, Univ., France), ARVID HOPE (Norwegian  
Underwater Technology Center A/S, Bergen, Norway), LOTHAR  
ROCKER, KARL KIRSCH (Berlin, Free Univ., Germany), and  
CLAUDE GHARIB (Lyon I, Univ., France) Aviation, Space, and  
Environmental Medicine (ISSN 0095-6562) vol. 64, no. 4 April  
1993 p. 287-294. Research supported by ESA and DRET  
refs

(Contract BMFT-01-QV-8712)

Copyright

The aim of this study was to determine what effects social isolation and confinement stress had on the volume regulating hormones. In six healthy male subjects, during a 28-d isolation and confinement study (ESA-ISEMSI'90), hematocrit, blood pressure and resting heart rate, plasma cortisol, renin, aldosterone, arginine vasopressin levels besides the electrolyte balance and plasma creatinine were measured. During the confinement, an elevated systolic blood pressure was observed together with an increase in MHPG corresponding to an elevated mental work load. The pattern displayed by volume regulating hormones was not only characteristic of confinement stress but also reflected changes in the water and electrolyte metabolism. The increased creatinine levels seen throughout the study were regarded as consequences of hypohydration, and an enhanced muscular catabolism due to reduced physical activity. A similar pattern of hormone modifications was obtained in a head-down tilt of the same duration, indicating that some of the described modifications are probably related to isolation and confinement stress.

Author (revised)

A93-35496

**CHANGES IN BODY FLUID COMPARTMENTS DURING  
HYPOHYDRATION AND REHYDRATION IN  
HEAT-ACCLIMATED TROPICAL SUBJECTS**

M. V. SINGH, S. B. RAWAL, G. PICHAN, and A. K. TYAGI (Defence Inst. of Physiology and Allied Sciences, Delhi, India) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 4 April 1993 p. 295-299. refs  
Copyright

Alterations in different compartment fluid status under graded hypohydration and rehydration were evaluated in 28 heat-acclimated male volunteers from tropical regions of India under hot dry conditions in a climatic chamber. Up to the 2 percent hypohydration, a major contribution towards sweat loss was observed from the interstitial fluid (ISF) compartment. At higher levels of hypohydration, no further significant loss from ISF was seen, though significant losses in intracellular fluid (ICF) and plasma volume were apparent. At the 4 percent hypohydration level, a maximum fluid contribution was met by the ICF compartment. Significant increases observed in sweat K(+) at 3 and 4 percent also indicate the ICF mobilization, which is rich in K(+) ions. On partial rehydration, the ISF compartment held the repletion fluid in excess and was found to be enough to restore sweat rate to euhydration level. This study clearly indicates this sudorific gain is achieved with partial restoration alone in subjects hypohydrated to 3 and 4 percent levels. When hypohydration levels over 2 percent are involved, assessment of total body water and/or plasma volume alone may not give the exact fluid status of hypohydrated subjects, and estimation of ICF compartment should have preference over them. AIAA

**A93-35497  
POSTURAL STABILIZATION ON A MOVING PLATFORM  
OSCILLATING AT HIGH FREQUENCIES**

ILMARI PYYKKO (Helsinki, Univ. Hospital, Finland), HEIKKI AALTO, JUKKA STARCK (Inst. of Occupational Health, Vantaa, Finland), and HISAYOSHI ISHIZAKI (Hamamatsu Univ., Japan) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 4 April 1993 p. 300-305. refs  
Copyright

The effect of a fore-aft oscillating platform on postural stability was studied in nine healthy volunteers. The force platform technique was used with automatic analysis that evaluated the position of the center point of force as a function of time. The duration of stimulation lasted 90 s and the perturbation frequencies ranged from 8 to 24 Hz, and were given at constant rms acceleration of 4 m/sq-s. When compared with a vibration-free baseline stance, horizontal vibration of the platform caused significantly worse postural stability in all subjects. Test frequencies of 8 and 10 Hz produced greater sway velocities than perturbation at frequencies of 14 and 16 Hz. The results indicate that horizontal perturbation of the support surface leads to postural instability that is frequency-dependent. Author (revised)

**A93-35500  
BIBLIOGRAPHIC GUIDE TO PUBLICATIONS IN AEROSPACE  
MEDICINE AND RELATED TOPICS**

MELCHOR J. ANTUNANO (FAA, Civil Aeromedical Inst., Oklahoma City, OK) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 4 April 1993 p. 327-336.  
Copyright

A comprehensive listing is given of international publications in clinical aerospace medicine, operational aerospace medicine, aerospace physiology, environmental medicine/physiology, diving medicine/physiology, aerospace human factors, and other important topics related to aerospace medicine. The emphasis is on books rather than articles from periodicals. AIAA

**A93-36723  
CHANGES IN THE BRAIN BLOOD FLOW AND RESPIRATION  
DURING PSYCHOEMOTIONAL STRESS [IZMENENIIA  
MOZGOVOGO KROVOTOKA I DYKHANIIA PRI  
PSIKHOEMOTSIONAL'NOM NAPRIAZHENII]**

E. B. STEPANIAN and V. N. SYSOEV (Voenno-Meditsinskaia Akademiia, St. Petersburg, Russia) Fiziologiya Cheloveka (ISSN 0131-1646) vol. 19, no. 2 Mar.-Apr. 1993 p. 29-36. In

Russian. refs  
Copyright

Changes in the respiration pattern and in the dynamics of the brain blood flow during work under psychoemotional stress were investigated, taking into account the degree of the subjects' neuroticism, as determined from a questionnaire. The results presented include the parameters of the brain blood flow and respiration which most adequately reflect the degree of psychoemotional stress and of the brain blood-flow dynamics in subjects with different degrees of neuroticism. AIAA

**A93-36724  
STRUCTURAL AND CYTOCHEMICAL SIGNS OF THE  
DEVELOPMENT OF DEADAPTATION, AS DETERMINED FROM  
BLOOD CHARACTERISTICS [STRUKTURNYE I  
TSITOKHIMICHESKIE PRIZNAKI FORMIROVANIYA  
DEZADAPTATSII PO POKAZATELIAM KROVI]**

P. S. PASHCHENKO (Voenno-Meditsinskaia Akademiia, St. Petersburg, Russia) Fiziologiya Cheloveka (ISSN 0131-1646) vol. 19, no. 2 Mar.-Apr. 1993 p. 65-75. In Russian. refs  
Copyright

The dynamics of compensative-adaptive blood-cell reconstructions in the peripheral blood of humans was investigated in pilots aged 25-52. It was found that, starting from the age of 35, these subjects displayed the presence of structurally distorted granulocytes and blood lymphocytes, not observed in the blood of nonpilots. At the age of 45-47, most pilots displayed signs of cellular deadadaptation. The paper proposes methods for determining the degree of deadadaptation from the blood-cell characteristics of pilots and methods for its early diagnosis. AIAA

**A93-36742  
NEW ASPECTS OF USING HYPERBARIC OXYGENATION IN  
AVIATION MEDICINE [NOVYE ASPEKTY PRIMENENIYA  
GIPERBARICHESKOI OKSIGENATSII V AVIATSIONNOI  
MEDITSINE]**

I. N. CHERNIAKOV and A. A. SHISHOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050) no. 12 Dec. 1992 p. 52-54. In Russian. refs  
Copyright

The effectiveness of hyperbaric oxygenation (HBO) as a method for increasing the functional reserves of the organism and its resistance to acute hypoxia and the Coriolis effect was investigated in experiments conducted in a pressure chamber on normal human subjects and in subjects with abnormally high sensitivity to the effects of altitude and in subjects with abnormally low statokinetic ability. Results indicate that a single HBO treatment is sufficient to speed up the recovery of an operator whose functional state and work capacity were lowered as a result of prolonged flight training. AIAA

**A93-36743  
OCCUPATIONAL HEALTH PROBLEMS IN AVIATION  
MEDICINE [PROBLEMA PROFESSIONAL'NOGO ZDOROV'IA V  
AVIATSIONNOI MEDITSINE]**

S. A. BUGROV, E. V. LAPAEV, V. A. PONOMARENKO, and G. P. STUPAKOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050) no. 1 Jan. 1993 p. 61-64. In Russian.  
Copyright

The paper proposes a new methodological concept for occupational health support in aviation medicine, which includes methods for the evaluation of a pilot's psychophysiological state and for the prevention of its deterioration. It was found that, among the factors which lower the work capacity of a pilot, one of the most prominent is chronic asthenia caused by the inadequacy of the pilot's flying skills due to the complexity of the tasks. Preventive measures include educational computer programs enabling a pilot to increase his education and experience and physical therapy which includes manual massage, electrostimulation, electrotranquilization of CNS, relaxation exercises, hydrotherapy, psychosomatic self-regulation exercises, and athletic training. AIAA



A93-36745

**DRUGS FOR SUSTAINING THE WORK CAPACITY OF AIRCRAFT PERSONNEL DURING EXTREME EMOTIONAL STRESS (FARMAKOLOGICHESKIE SREDSTVA PODDERZHANIYA RABOTOSPOSOBNOSTI LETNOGO SOSTAVA PRI CHREZMERNOM EMOTSIONAL'NOM NAPRIAZHENII)**

P. V. VASIL'EV, G. D. GLOD, and S. I. SYTNIK  
Voenno-Meditsinskii Zhurnal (ISSN 0026-9050) no. 2 Feb. 1993 p. 54-57. In Russian.

Copyright

Using literature data, the paper compares the effectiveness of various psychotropic drugs, including tranquilizers, for relieving the symptoms of emotional stress in aircraft personnel. Data presented include the effects of 'fenasepam', 'trioxasin' (trimetozine), 'mebikar', 'fenibut', pyroksan (proroxan), trioxazin plus sydnocarb, 'fenasepam' plus sydnocarb, and propranolol on subjects experiencing emotional disturbance, extreme emotional reactions, situational emotional stress, adverse attitude reactions to some activities, emotions related to long-term shifts, sleep disturbance due to emotional state, rehabilitation after excessive emotionality, primary stages of nervous disturbance, and cardiovascular reactions.

AIAA

N93-25186# Los Alamos National Lab., NM.

**BIOMAGNETIC LOCALIZATION FROM TRANSIENT QUASI-STATIC EVENTS**

J. C. MOSHER, R. M. LEAHY, and P. S. LEWIS 1993 5 p  
Presented at the IEEE International Conference on Acoustics, Speech, and Signal Processing, Minneapolis, MN, 27-30 Apr. 1993

(Contract W-7405-ENG-36)

(DE93-007328; LA-UR-93-402; CONF-930489-1) Avail: CASI HC A01/MF A01

Sensory stimuli, such as auditory, visual, or somatosensory, evoke neural responses in very localized regions of the brain. A SQUID biomagnetometer can measure the very weak fields that are generated outside of the head by this response. A simple source and head model of current dipoles inside a conducting sphere is typically used to interpret these magnetic field measurements or magnetoencephalogram (MEG). Locating dipole sources using data recorded from an array of biomagnetic sensors is distinguished from conventional array source localization techniques by the quasi-static transient nature of the data. Here, the basic MEG model is reviewed, then a localization example is given to motivate the need for partitioning the data to improve estimator performance. Tune-eigenspectrum analysis is introduced as a means of partitioning and interpreting spatio-temporal biomagnetic data. Examples using both simulated and somatosensory data are presented.

DOE

N93-25214# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.

**THE PREVALENCE OF ARTIFICIAL LENS IMPLANTS IN THE CIVIL AIRMAN POPULATION Final Report**

VAN B. NAKAGAWARA, FAREDOON K. LOOCHAN, and KATHRYN J. WOOD Mar. 1992 18 p  
(Contract FAA PROJ. AM-A-91-PHY-144)

(DOT/FAA/AM-92/14) Avail: CASI HC A03/MF A01

The use of artificial lens implants to correct for aphakia has become increasingly prevalent in the United States. This study analyzes the distribution of intraocular lens (IOL) implants in the civil airman population by type (unilateral, bilateral), class of medical certificate, and gender for a 4-year period (1982-85). Medical records were evaluated for all certified airmen who were carrying pathology codes for aphakia artificial lenses was higher for bilateral, second-class medical certificate holders, and female aphakics. However, the incidence of total and unilateral artificial lens implants declined in 1985. The implications of the study's findings for aeromedical certification are discussed. A change in the methods used to evaluate trends in the use of IOL in the airman population is recommended.

Author

N93-25407# Joint Publications Research Service, Arlington, VA.  
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: LIFE SCIENCES

30 Sep. 1992 92 p Transl. into ENGLISH from various Russian articles

(JPRS-ULS-92-022) Avail: CASI HC A05/MF A01

The translated article covers the following topic: results of blood tests among EO-2, -3, and -4 Space Crews.

CASI

N93-25567\*# National Inst. of Health, Bethesda, MD. Office of Technology Transfer.

**IMMUNOCONJUGATES: MAGIC BULLETS FOR CANCER THERAPY?**

DANIEL R. PASSERI and JACK SPIEGEL /In NASA, Washington, Technology 2002: The Third National Technology Transfer Conference and Exposition, Volume 1 p 71-76 Feb. 1993

Avail: CASI HC A02/MF A04

Conjugating cytotoxic agents to antibodies allows for site-specific delivery of the agent to tumor cells and should provide increased efficacy and reduced non-specific toxicity. These site-specific cytotoxic agents are known as immunoconjugates or 'magic bullets' and have demonstrated great promise as therapeutic agents for cancer and other diseases. The historical developments and future potential of this new approach to cancer therapy are reviewed.

Author

N93-25568\*# Johns Hopkins Univ., Laurel, MD. Applied Physics Lab.

**AUTOMATED SYSTEM FOR EARLY BREAST CANCER DETECTION IN MAMMOGRAMS**

ISAAC N. BANKMAN, DONG W. KIM, WILLIAM A. CHRISTENS-BARRY, IRVING N. WEINBERG, OLGA B. GATEWOOD, and WILLIAM R. BRODY /In NASA, Washington Technology 2002: The Third National Technology Transfer Conference and Exposition, Volume 1 p 77-85 Feb. 1993

Avail: CASI HC A02/MF A04

The increasing demand on mammographic screening for early breast cancer detection, and the subtlety of early breast cancer signs on mammograms, suggest an automated image processing system that can serve as a diagnostic aid in radiology clinics. We present a fully automated algorithm for detecting clusters of microcalcifications that are the most common signs of early, potentially curable breast cancer. By using the contour map of the mammogram, the algorithm circumvents some of the difficulties encountered with standard image processing methods. The clinical implementation of an automated instrument based on this algorithm is also discussed.

Author

N93-25569\*# Johns Hopkins Univ., Laurel, MD. Applied Physics Lab.

**THE DESIGN OF MECHANICALLY COMPATIBLE FASTENERS FOR HUMAN MANDIBLE RECONSTRUCTION**

JACK C. ROBERTS, JOHN A. ECKER, and PAUL J. BIERMANN /In NASA, Washington, Technology 2002: The Third National Technology Transfer Conference and Exposition, Volume 1 p 86-95 Feb. 1993

Avail: CASI HC A02/MF A04

Mechanically compatible fasteners for use with thin or weakened bone sections in the human mandible are being developed to help reduce large strain discontinuities across the bone/implant interface. Materials being considered for these fasteners are a polyetheretherketone (PEEK) resin with continuous quartz or carbon fiber for the screw. The screws were designed to have a shear strength equivalent to that of compact/trabecular bone and to be used with a conventional nut, nut plate, or an expandable shank/blind nut made of a ceramic filled polymer. Physical and finite element models of the mandible were developed in order to help select the best material fastener design. The models replicate the softer inner core of trabecular bone and the hard outer shell of compact bone. The inner core of the physical model consisted of an expanding foam and the hard outer shell consisted of ceramic particles in an epoxy matrix. This model has some of the cutting and drilling attributes of bone and may be

appropriate as an educational tool for surgeons and medical students. The finite element model was exercised to establish boundary conditions consistent with the stress profiles associated with mandible bite forces and muscle loads. Work is continuing to compare stress/strain profiles of a reconstructed mandible with the results from the finite element model. When optimized, these design and fastening techniques may be applicable, not only to other skeletal structures, but to any composite structure. Author

**N93-25592\*#** Johns Hopkins Univ., Laurel, MD. Applied Physics Lab.

#### **AUTOMATIC DETECTION OF SEIZURES WITH APPLICATIONS**

DALE E. OLSEN, JOHN C. HARRIS, PROTAGORAS N. CUTCHIS, JOHN A. CRISTION, RONALD P. LESSER (Johns Hopkins Univ., Baltimore, MD.), and W. ROBERT S. WEBBER (Johns Hopkins Univ., Baltimore, MD.) /in NASA, Washington, Technology 2002: The Third National Technology Transfer Conference and Exposition, Volume 1 p 301-307 Feb. 1993

Avail: CASI HC A02/MF A04

There are an estimated two million people with epilepsy in the United States. Many of these people do not respond to anti-epileptic drug therapy. Two devices can be developed to assist in the treatment of epilepsy. The first is a microcomputer-based system designed to process massive amounts of electroencephalogram (EEG) data collected during long-term monitoring of patients for the purpose of diagnosing seizures, assessing the effectiveness of medical therapy, or selecting patients for epilepsy surgery. Such a device would select and display important EEG events. Currently many such events are missed. A second device could be implanted and would detect seizures and initiate therapy. Both of these devices require a reliable seizure detection algorithm. A new algorithm is described. It is believed to represent an improvement over existing seizure detection algorithms because better signal features were selected and better standardization methods were used. Author (revised)

**N93-25593\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

#### **A FIBER OPTIC PROBE FOR THE DETECTION OF CATARACTS**

RAFAT R. ANSARI and HARBANS S. DHADWAL (State Univ. of New York, Stony Brook.) /in NASA, Washington, Technology 2002: The Third National Technology Transfer Conference and Exposition, Volume 1 p 308-316 Feb. 1993

Avail: CASI HC A02/MF A04

A compact fiber optic probe developed for on-orbit science experiments was used to detect the onset of cataracts, a capability that could eliminate physicians' guesswork and result in new drugs to 'dissolve' or slow down the cataract formation before surgery is necessary. The probe is based upon dynamic light scattering (DLS) principles. It has no moving parts, no apertures, and requires no optical alignment. It is flexible and easy to use. Results are presented for excised but intact human eye lenses. In a clinical setting, the device can be easily incorporated into a slit-lamp apparatus (ophthalmoscope) for complete eye diagnostics. In this set-up, the integrated fiber optic probe, the size of a pencil, delivers a low power cone of laser light into the eye of a patient and guides the light which is backscattered by the protein molecules of the lens through a receiving optical fiber to a photo detector. The non-invasive DLS measurements provide rapid determination of protein crystalline size and its size distribution in the eye lens. Author (revised)

**N93-25594\*#** General Electric Co., Houston, TX. Government Services.

#### **MAC TO VAX CONNECTIVITY: HEARTRATE SPECTRAL ANALYSIS SYSTEM**

HASAN H. RAHMAN and MONAZER FARUQUE /in NASA, Washington, Technology 2002: The Third National Technology Transfer Conference and Exposition, Volume 1 p 317-321 Feb. 1993 Prepared for NASA. Johnson Space Center, Houston, TX

Avail: CASI HC A01/MF A04

The heart rate Spectral Analysis System (SAS) acquires and

analyzes, in real-time, the Space Shuttle onboard electrocardiograph (EKG) experiment signals, calculates the heart rate, and applies a Fast Fourier Transformation (FFT) to the heart rate. The system also calculates other statistical parameters such as the 'mean heart rate' over specific time period and heart rate histogram. This SAS is used by NASA Principal Investigators as a research tool to determine the effects of weightlessness on the human cardiovascular system. This is also used to determine if Lower Body Negative Pressure (LBNP) is an effective countermeasure to the orthostatic intolerance experienced by astronauts upon return to normal gravity. In microgravity, astronauts perform the LBNP experiment in the mid deck of the Space Shuttle. The experiment data are downlinked by the orbiter telemetry system, then processed and analyzed in real-time by the integrated Life Sciences Data Acquisition (LSDS) - Spectral Analysis System. The data system is integrated within the framework of two different computer systems, VAX and Macintosh (Mac), using the networking infrastructure to assist the investigators in further understanding the most complex machine on Earth--the human body.

Author (revised)

**N93-25629#** Los Alamos National Lab., NM. Life Sciences Div. **THE ACUTE INHALATION TOXICITY OF PYROLYSIS PRODUCTS OF HALON 1301 Final Report, 1 Apr. 1987 - 30 Sep. 1992**

BRUCE E. LEHNERT 31 Dec. 1992 96 p

(Contract DA PROJ. 3M1-62787-A-875)

(AD-A260874) Avail: CASI HC A05/MF A01

This final report summarizes investigations conducted during this project. During the course of the project, investigations were undertaken to address the following objectives: (1) to develop exposure systems and methodology to deliver pure, stable atmospheres of HF, HBr, or HCl to laboratory rats; (2) to determine the toxicological equivalency of inhaled HF, HBr, and HCl in the upper and lower respiratory tract; (3) characterize the anatomical sites of injury caused by HF, HCl, and HBr when inhaled at high mass concentrations through the nasal (NB) and oral (MB) pathways; (4) to assess the relative toxicities of the above halides when inhaled at high mass concentrations during mouth and nose breathing; (5) to characterize the upper and lower respiratory tract lesion(s) produced by HCl inhalation in the nose breathing (NB) and mouth breathing (MB) rats during CO<sub>2</sub>-induced increased minute ventilation; (6) to examine the toxicity of HF when administered directly into the rat's lung; (7) to determine if work performance incapacitation occurs after acute high concentration inhalation of HCl via the nose (NB) or the mouth (MB); (8) to assess post-exposure exercise as a potentiator of the severity of expression of halide-induced respiratory tract injury; and (9) to initiate studies to determine whether or not lung injury becomes more pronounced after halides are breathed in combination with a particulate phase. DTIC

**N93-25900#** CryoLife, Inc., Marietta, GA.

#### **CELLULAR AND TISSUE INJURY DURING NONFREEZING COLD INJURY AND FROSTBITE Triannual Report No. 6, Sep. - Nov. 1992**

8 Dec. 1992 6 p

(Contract N00014-91-C-0044)

(AD-A260574) Avail: CASI HC A02/MF A01

Metabolic perturbation and enzyme structure-function studies are presented. We have now almost completed our investigation of the structure-function relationships that are thought to be involved with regulating the activity of phosphofructokinase (PFK) in vivo. Specifically, we set out to study how alterations in quaternary structure account for enzyme inhibition in red blood cells under cold, acidotic conditions. Prior in vitro studies have shown that phosphofructokinase from erythrocytes (and several other mammalian cells and tissues) dissociates from active tetrameres into inactive dimers and monomers at low Ph. In addition, we have previously demonstrated that this reversible phenomenon accounts for the inhibition of PFK activity in vivo in ischemic myocardium. DTIC

**N93-25944#** Duke Univ., Durham, NC. Medical Center.

**PRIMARY EVENTS IN OLFACTORY RECEPTION Final Report**

ROBERT R. ANHOLT 8 Jan. 1993 13 p

(Contract DAAL03-89-K-0178)

(AD-A260562; ARO-26767.6-LS) Avail: CASI HC A03/MF A01

This project was designed to characterize olfactory tissue-specific proteins previously identified with a library of monoclonal antibodies raised against frog olfactory cilia. First, we showed that our olfactory tissue-specific monoclonal antibodies all recognize different molecular forms of the same protein. We named this protein 'olfactomedin'. We then proceeded to purify olfactomedin and characterize it biochemically and immunohistochemically. We showed that olfactomedin is produced only in olfactory tissue by sustentacular cells and Bowman's glands and that it is deposited in the lower mucus layer of olfactory neuroepithelium. Next, we extracted mRNA from olfactory tissue and constructed a cDNA library. We obtained partial sequence information of the N-terminus of purified olfactomedin and used these data to design a degenerate oligonucleotide probe for the identification of a full-length cDNA clone which encodes olfactomedin. This clone was sequenced and found to encode a 448 amino acid protein preceded by a leader peptide of 16 amino acids. Analysis of the sequence showed no homologies with any known protein. Examination of its amino acid sequence by Chou-Fasman analysis in combination with biochemical and immunochemical evidence obtained previously enabled us to construct a model for olfactomedin which identifies this protein as a novel olfactory tissue-specific extracellular matrix protein, which forms the main structural component of the extracellular mucous matrix of olfactory neuroepithelium and which may trigger the growth and differentiation of the dendritic knob and its olfactory cilia that house the olfactory transduction machinery. DTIC

**N93-26068#** Pennsylvania State Univ., University Park. Dept. of Nutrition.

**THE ROLE OF PYRIDOXINE AS A COUNTERMEASURE FOR IN-FLIGHT LOSS OF LEAN BODY MASS Final Report**

JOYCE A. GILBERT In NASA. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1992, Volume 1 4 p Dec. 1992

(Contract NGT-44-005-803)

Avail: CASI HC A01/MF A02

Ground based and in flight research has shown that humans, under conditions of microgravity, sustain a loss of lean body tissue (protein) and changes in several biological processes including, reductions in red blood cell mass, and neurotransmitters. The maintenance of muscle mass, the major component of lean body mass, is required to meet the needs of space station EVAs. Central to the biosynthesis of amino acids, the building blocks of protein, is pyridoxine (vitamin B-6). Muscle mass integrity requires the availability of vitamin B-6 for protein metabolism and neurotransmitter synthesis. Furthermore, the formation of red blood cells require pyridoxine as a cofactor in the biosynthesis of hemoglobin, a protein that carries oxygen to tissues. In its active form, pyridoxal-5'-phosphate (PLP), vitamin B-6 serves as a link between amino acid and carbohydrate metabolism through intermediates of glycolysis and the tricarboxylic acid cycle. In addition to its role in energy metabolism, PLP is involved in the biosynthesis of hemoglobin and neurotransmitter which are necessary for neurological functions. Alterations in pyridoxine metabolism may affect countermeasures designed to overcome some of these biochemical changes. The focus of this research is to determine the effects of microgravity on the metabolic utilization of vitamin B-6, integrating nutrition as an integral component of the countermeasure (exercise) to maintain lean body mass and muscle strength. The objectives are: 1) to determine whether microgravity effects the metabolic utilization of pyridoxine and 2) to quantitate changes in B-6 vitamers distribution in tissue and excreta relative to loss of lean body tissue. The rationale for this study encompasses the unique challenge to control biochemical mechanisms effected during space travel and the significance of pyridoxine to maintain and counter muscle integrity

for EVA activities. This experiment will begin to elucidate the importance of biochemical interactions between micronutrients and the homeostasis condition of biological processes in the space environment. To address this research topic a simulated microgravity model has been developed. The experiment uses radioisotopically labelled pyridoxine administered as an oral dose to rats which are maintained by tail suspension to simulate a microgravity environment. At the termination of the study, liver, muscle, blood and urine are collected and analyzed by reverse phase high pressure liquid chromatography to determine the quantity and distribution of the B-6 vitamers in tissue and excreta relative to lean body tissue loss. Earlier studies, published by this investigator, have shown that differences in vitamers distribution among samples from experimental versus control subjects indicate changes in metabolic utilization and storage of vitamin B-6.

Author

**N93-26133#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**VASCULAR UPTAKE OF REHYDRATION FLUIDS IN HYPOHYDRATED MEN AT REST AND EXERCISE**

J. E. GREENLEAF (Shaklee US, Inc., San Francisco, CA.), G. GEELLEN (Shaklee US, Inc., San Francisco, CA.), C. G. R. JACKSON (Shaklee US, Inc., San Francisco, CA.), J.-L. SAUMET (Shaklee US, Inc., San Francisco, CA.), L. T. JUHOS (Shaklee US, Inc., San Francisco, CA.), L. C. KEIL (Shaklee US, Inc., San Francisco, CA.), D. FEGAN-MEYER (Shaklee US, Inc., San Francisco, CA.), A. DEARBORN (Shaklee US, Inc., San Francisco, CA.), H. HINGHOFFER-SZALKAY (Shaklee US, Inc., San Francisco, CA.), and J. H. WHITTAM (Shaklee US, Inc., San Francisco, CA.) Aug. 1992 49 p

(Contract RTOP 199-18-12-07)

(NASA-TM-103942; A-92113; NAS 1.15:103942) Avail: CASI HC A03/MF A01

The purpose of this study was to formulate and to evaluate rehydration drinks, which would restore total body water and plasma volume (PV), for astronauts to consume before and during extravehicular activity, a few hours before reentry, and immediately after landing. In the first experiment (rest, sitting), five healthy men (23-41 yr), previously dehydrated for 24 hr., drank six (1a, 2, 4, 5, 6, 7) fluid formulations (one each at weekly intervals) and then sat for 70 min. Pre-test PV were measured with Evans blue dye and changes in PV were calculated with the hematocrit-hemoglobin transformation equation. This rest experiment simulated hypohydrated astronauts preparing for reentry. The second experiment (exercise, supine) followed the same protocol except four healthy men (30-46 yr) worked for 70 min. in the supine position on a cycle ergometer at a mean load of 71 +/- 1 percent of their peak aerobic work capacity. This exercise experiment simulated conditions for astronauts with reduced total body water engaging in extravehicular activity.

Author (revised)

**N93-26218#** Army Aeromedical Research Lab., Fort Rucker, AL.

**THE USE OF EXTENDED WEAR CONTACT LENSES IN THE AVIATION ENVIRONMENT: AN ARMY-WIDE STUDY Final Report**

MORRIS R. LATTIMORE and RHONDA L. CORNUM Sep. 1992 185 p

(Contract DA PROJ. 3M1-62787-A-8879)

(AD-A260938; USAARL-92-35) Avail: CASI HC A09/MF A02

Standard refractive error correction options for the M-43 protective mask have proven to be incompatible with the Helmet Display Unit (HDU) component of the AH-64 Apache Integrated Helmet and Display Sighting System (IHADSS). Glue-on and outsert packages push the HDU, a Maxwellian-view virtual imaging system, far enough from the spectacle-wearing aviator's eye to significantly reduce the available field-of-view. Consequently, portions of critical peripheral instrumentation and weapon system overlays cannot be visualized. In November 1988, the U.S. Army Aeromedical Research Laboratory (USAARL) initiated the AH-64 contact lens research protocol to provide both an interim readiness fix and to

develop a comprehensive database on contact lens wear in a variety of environments. The protocol was organized from three perspectives with concerns directed toward operational and flight safety, ocular health, and corneal physiology issues, and concluded at the end of September 1991. Fundamental operational and safety data were chronicled, along with written questionnaires, to assess subjective effectiveness of routine contact lens use. Ocular health complications were collated from the aviation medicine, optometric, and ophthalmological communities. Clinical and physiological data were gathered by one USAARL optometrist, and two contract civilian optometrists and their supporting technicians. DTIC

**N93-26945\*** National Aeronautics and Space Administration, Washington, DC.

**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 373)**

Mar. 1993 74 p

(NASA-SP 7011(373); NAS 1.21:7011(373)) Avail: CASI HC A04/MF A01

This bibliography lists 206 reports, articles and other documents introduced into the NASA Scientific and Technical Information System during Feb. 1993. Subject coverage includes: aerospace medicine and physiology, pharmacology, toxicology, environmental effect, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance. Author

## 53

## BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

**A93-34593**

**EUROPEAN ASTRONAUT CANDIDATES IN TRAINING IN THE CIS**

M. CHELI-MERCHEZ, C. FUGLESANG, and P. DUQUE (European Astronauts Centre, Cologne, Germany) ESA Bulletin (ISSN 0376-4265) no. 73 Feb. 1993 p. 61-67.

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Three European astronauts underwent four weeks of training in the CIS's Star City complex in 1992. It is noted that the initial and final sessions of this training program were devoted to psychological training aimed at recovery from periods of severe stress. The program followed the spacecraft structure and mission profile typical of Soyuz and Soyuz-Mir flight plans, and included physical and vestibular training. The 'Sokol' spacesuit was employed, as were centrifuges and a neutral-buoyancy facility. AIAA

**A93-35099\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**THINGS THAT GO BUMP IN THE LIGHT - ON THE OPTICAL SPECIFICATION OF CONTACT SEVERITY**

MARY K. KAISER (NASA, Ames Research Center, Moffett Field, CA) and ANIL V. PHATAK (Analytical Mechanics Associates, Inc., Sunnyvale, CA) Journal of Experimental Psychology: Human Perception and Performance (ISSN 0096-1523) vol. 19, no. 1 1993 p. 194-202. refs

Psychologists are intrigued with the idea that optical variables can specify not only the time until an object impacts an observer but also the severity of the impact. However, the mapping between the optical variables and the kinematic variables has been misstated, erroneously implying that there exist critical values of the optical variables used for locomotion and control. In this commentary, the mathematical relationship between the optical and kinematic variables is reexamined and the erroneous assumptions that have led to the proposal of critical values are shown. Also examined are the empirical data on deceleration to

approach to assess whether the proposed optical variables are likely candidates for control strategies. Finally, problems associated with numerical approximations to dynamic systems, particularly when analytic solutions exist, are discussed. Author (revised)

**A93-35220**

**ADAPTATION OF YOUNG PILOTS TO NEW CONDITIONS OF THEIR WORK (SOCIAL-PSYCHOLOGICAL ASPECTS)**

[ADAPTATSIIA MOLODYKH LETCHIKOV K NOVYM USLOVIAM PROFESSIONAL'NOI DEIATEL'NOSTI /SOTSIAL'NO-PSIKHOLOGICHESKIE ASPEKTY/]

N. G. KORSHEVER and I. P. BONDAREV Aviakosmicheskaja i Ekologicheskaja Meditsina (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 22-25. In Russian. refs Copyright

The adaptation of 146 young pilots to flying conditions was investigated. The pilots filled in a questionnaire containing questions on motivation, performance of flight duties, a self-assessment of professional achievements, and one's attitude toward other members of one's flight unit. The experimental findings can be used to improve the psychological relationships of young pilots during their adaptation to new work conditions. AIAA

**A93-35233**

**PSYCHOPHYSIOLOGICAL PRINCIPLES OF FLIGHT TRAINING FOR ACTIONS IN NONROUTINE SITUATIONS**

[PSIKHOFIZIOLOGICHESKIE OSNOVY PODGOTOVKI LETNOGO SOSTAVA K DEISTVIAM V NESTANDARTNYKH SITUATSIYAKH]

V. A. PONOMARENKO Aviakosmicheskaja i Ekologicheskaja Meditsina (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 18-24. In Russian.

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Psychological and physiological mechanisms characterizing the behavioral patterns of a pilot in emergency situations are addressed. In emergencies, there are two levels of pilot responses: adaptive-defensive reactions, which activate automated actions, and evaluation-decision-making reactions, which promote intellectual transformations of information to compare the conceptual and information models. If pilot reaction is to be successful in an emergency, specific mental skills are needed to enhance the rate of abstraction and determination of key signs which are the basis for decision making. Experimental data on the reliability and adequacy of pilot response in real flight under simulated contingencies are presented. Typical disorders of cognitive psychological processes, as well as behavioral disorganization under these conditions, are described. The components of psychophysiological adequacy of pilots and the principles and means of its creation are discussed. AIAA

**A93-35241**

**THE ASTHENIC SYNDROME AND THE DYNAMICS OF MENTAL-WORK CAPACITY (ASTENICHESKII SINDROM I PSIKHICHESKAYA RABOTOSPOSOBNOST')**

E. A. SHAPOSHNIKOV, K. K. IOSELIANI, V. S. CHUGUNOV, and A. L. NARINSKAIA Aviakosmicheskaja i Ekologicheskaja Meditsina (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 59-65. In Russian. refs

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The study presents results of clinical psychological and neurophysiological studies of 150 persons in 105 white-collar occupations who were treated at the Moscow Clinic of Neuroses for the asthenic syndrome, which is caused by occupational overload or emotional stress. The obtained data showed that the development of the asthenic syndrome exhibits certain stages depending on the duration and severity of emotional, vegetative, dissomnic, and other psychosomatic disorders. It is shown that, as one of the key integral indices of human adaptability, mental-work capacity was maintained at a sufficiently high level for a long period during the asthenic syndrome. AIAA

A93-35249

**CONTROL OF THE DEVELOPMENT OF OCCUPATIONALLY IMPORTANT QUALITIES WITH THE AIM OF IMPROVING FLIGHT-PERSONNEL TRAINING [UPRAVLENIE RAZVITIEM PROFESSIONAL'NO VAZHNYKH KACHESTV S TSEL'IU SOVERSHENSTVOVANIIA PODGOTOVKI LETNOGO SOSTAVA]**

I. V. AGAPOV and V. A. PONOMARENKO Aviakosmicheskaja i Ekologicheskaja Meditsina (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 14-19. In Russian. refs  
Copyright

Issues concerning the development of occupationally important qualities (OIQs) of pilots using a specially devised set of psychological, pedagogical, and psychophysiological methods are examined. Some mechanisms for the creation of an integrated system of OIQs during pilot training are discussed. The features characterizing OIQ effects on the specific aspects and parameters of pilot activity are examined. AIAA

A93-35251

**PSYCHOSOMATIC STATUS AND FLYING SKILL DURING GEOMAGNETIC DISTURBANCES [PSIKHOSOMATICHESKII STATUS I KACHESTVO PILOTIROVANIIA U LETCHIKOV V PERIOD GEOMAGNITNYKH VOZMUSHCHENII]**

G. A. USENKO Aviakosmicheskaja i Ekologicheskaja Meditsina (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 23-27. In Russian. refs  
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Based on psychological tests, a large group of pilots was divided into individuals with high and low levels of anxiety. During geomagnetic disturbances, pilots with a high level of anxiety are found to operate at a new, more intensive homeostatic level which is accompanied by a decreased functional activity of the central nervous system, leading to a sharp decline in flying skills. AIAA

A93-35499

**ALCOHOLISM AND TREATMENT IN AIRLINE AVIATORS - ONE COMPANY'S RESULTS**

CHRISTOPHER F. FLYNN (USAF, Brooks AFB, TX), MICHAEL S. STURGES, RONALD J. SWARSEN (United Airlines, Medical Dept., Denver, CO), and GARY M. KOHN (United Airlines, Chicago, IL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 64, no. 4 April 1993 p. 314-318. refs  
Copyright

An alcohol treatment program for pilots at one major airline company is briefly discussed. The treatment resulted in 87 percent of alcoholic pilots returning to flight duties after substance abuse treatment, while relapse occurred in the other 13 percent. AIAA

A93-36229\* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**THE IMPACT OF VISUAL NOISE ON SPATIAL ORIENTATION**  
BRIAN P. DYRE and GEORGE J. ANDERSEN (Illinois Univ., Urbana) In Human Factors Society, Annual Meeting, 34th, Orlando, FL, Oct. 8-12, 1990, Proceedings. Vol. 2 Santa Monica, CA Human Factors Society 1990 p. 1577-1581. refs  
(Contract NCC2-613; NAG2-308; NSF BNS-89-08512)  
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The effect of noise in the visual environment on spatial orientation was investigated experimentally using postural stability as an objective measure. Noise in the displays was produced by randomly shifting the phase lag of the three-dimensional motion function for each individual point within the display. Greater postural sway was induced by displays containing no noise in the global optical flow pattern than displays containing noise, suggesting that spatial orientation is strongly dependent on global optic flow information in the visual field. To avoid pilot disorientation in some flight maneuvers, it is recommended that visual aids specifying global optic flow information be included in aircraft for flight environments with deficient global optic flow information. AIAA

A93-36583\* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**PERCEPTUAL EFFECTS OF SYNTHETIC REVERBERATION ON THREE-DIMENSIONAL AUDIO SYSTEMS**

DURAND R. BEGAULT (NASA, Ames Research Center, Moffett Field, CA) Audio Engineering Society, Journal (ISSN 0004-7554) vol. 40, no. 11 Nov. 1992 p. 895-904. refs  
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A psychoacoustic investigation was conducted in which five subjects gave localization judgments for headphone-delivered speech stimuli processed by nonindividualized head-related transfer functions, with and without synthetic 'spatial' reverberation added to the stimuli. Spatial reverberation minimized intracranially heard stimuli, but increased the magnitude of azimuth and elevation localization errors. The results are applicable to 3D sound systems and spatial sound field processors designed to increase the sensation of auditory 'spaciousness'. Author (revised)

A93-36744

**DIAGNOSTICS AND PROPHYLAXIS OF ADVERSE PSYCHOLOGICAL STATES IN MARINE AVIATION FLIGHT PERSONNEL [DIAGNOSTIKA I PROFILAKTIKA NEBLAGOPRIATNYKH PSIKHICHESKIKH SOSTOIANII U LETNOGO SOSTAVA KORABEL'NOI AVIATSI]**

S. G. MEL'NIK, A. V. SHAKULA, and A. V. BELINSKII Voenno-Meditsinskii Zhurnal (ISSN 0026-9050) no. 2 Feb. 1993 p. 52-54. In Russian. refs  
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Results are presented of an inquiry conducted among marine aviation flight personnel, regarding the effects of prolonged sailing on the psychosomatic and volitional states of these subjects. Results showed that pilots and navigators who took part in long-term sea voyages displayed symptoms of psychological distress including those of increased aggressiveness, hyperactivity, depression, unsociability, and anxiety. These mental conditions affected the piloting capacity and orientation in space of all aircraft personnel, but more so in the pilots of Yak-38 aircraft than in helicopter pilots. AIAA

N93-25203# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.

**ORGANIZATIONAL POLITICS, PARTICIPATION IN DECISION-MAKING, AND JOB SATISFACTION Final Report**

L. A. WITT Apr. 1992 15 p  
(Contract FAA PROJ. AM-C-92-HRR-122)  
(DOT/FAA/AM-92/17) Avail: CASI HC A03/MF A01

The study tested two hypotheses: (1) that organizational politics as measured by the Kacmar and Ferris (1991) Perceptions of Organizational Politics Scale would be negatively related to feelings of job satisfaction; and (2) that participation in decision-making (PDM) would moderate that relationship. In line with concerns for dispositional affect as a contributor to method variance and the possibility that biodata may explain some of the effects of organizational politics and PDM on job satisfaction, dispositional affect and biodata variables were included in the analyses. Hierarchical moderated multiple regression analyses conducted on data collected from 1,083 Federal employees confirmed the hypotheses. Author

N93-25213# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.

**A LONGITUDINAL EXAMINATION OF APPLICANTS TO THE AIR TRAFFIC CONTROL SUPERVISORY IDENTIFICATION AND DEVELOPMENT PROGRAM Final Report**

JENNIFER G. MYERS, ed. Apr. 1992 57 p  
(Contract FAA PROJ. AM-C-92-HRR-125)  
(DOT/FAA/AM-92/16) Avail: CASI HC A04/MF A01

The Federal Aviation Administration began development of an extensive longitudinal database on its air traffic controller workforce following the strike of 1981. Since that time, data have been collected on thousands of air traffic controllers, spanning a period which covers their application to the federal government for employment to their achievement of a first-line supervisor position.

This collection of papers examines a subset of air traffic control specialists who have completed the agency's supervisor selection program, beginning with their performance on the Office of Personnel Management test battery and other cognitive tests administered prior to completion of the air traffic controller Screen Program. Measures of academic, laboratory, and overall Screen performance were examined in relationship to aspects of performance in the supervisor selection program. Field training profiles were analyzed to determine differences between successful and unsuccessful supervisor selection program candidates and relationship with selection program performance. Finally, performance in the supervisor selection program was compared for those who were selected as first-line supervisors and those who were not.

Author

**N93-25595\***# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**THE APPLICATION OF INTEGRATED KNOWLEDGE-BASED SYSTEMS FOR THE BIOMEDICAL RISK ASSESSMENT INTELLIGENT NETWORK (BRAIN)**

KARIN C. LOFTIN (Krug Life Sciences, Inc., Houston, TX.), BEBE LY, LAURIE WEBSTER, JAMES VERLANDER (Krug Life Sciences, Inc., Houston, TX.), GERALD R. TAYLOR, GARY RILEY, CHRIS CULBERT, TINA HOLDEN (Lockheed Engineering and Sciences Co., Houston, TX.), and MARIANNE RUDISILL. In NASA, Washington, Technology 2002: The Third National Technology Transfer Conference and Exposition, Volume 1 p 322-331 Feb. 1993

Avail: CASI HC A02/MF A04

One of NASA's goals for long duration space flight is to maintain acceptable levels of crew health, safety, and performance. One way of meeting this goal is through the Biomedical Risk Assessment Intelligent Network (BRAIN), an integrated network of both human and computer elements. The BRAIN will function as an advisor to flight surgeons by assessing the risk of in-flight biomedical problems and recommending appropriate countermeasures. This paper describes the joint effort among various NASA elements to develop BRAIN and an Infectious Disease Risk Assessment (IDRA) prototype. The implementation of this effort addresses the technological aspects of the following: (1) knowledge acquisition; (2) integration of IDRA components; (3) use of expert systems to automate the biomedical prediction process; (4) development of a user-friendly interface; and (5) integration of the IDRA prototype and Exercise Countermeasures Intelligent System (ExerCISys). Because the C Language, CLIPS (the C Language Integrated Production System), and the X-Window System were portable and easily integrated, they were chosen as the tools for the initial IDRA prototype. The feasibility was tested by developing an IDRA prototype that predicts the individual risk of influenza. The application of knowledge-based systems to risk assessment is of great market value to the medical technology industry.

Author (revised)

**N93-25654#** Texas Univ., San Antonio. Health Science Center. **PROCEEDINGS OF WORKSHOP 1: THE HUMAN BRAINMAP DATABASE Final Report, 15 Apr. 1991 - 31 Aug. 1992**

PETER T. FOX and JACK L. LANCASTER. 17 Feb. 1993. 89 p. Workshop held in San Antonio, TX, 29 Nov. - 1 Dec. 1991 (Contract N00014-91-J-1903)

(AD-A260720) Avail: CASI HC A05/MF A01

The Human BrainMap Database is a software environment for meta-analysis of functional brain mapping experiments. In brief, BrainMap relates brain locations with behavioral functions. For any brain region, the behavioral conditions associated with that region can be returned. Conversely, for any behavioral function, the brain regions supporting that behavior can be retrieved. BrainMap is composed of three main parts: a relational database, graphical user interface (GUI), and a data-entry interface. BrainMap's database is constructed in a natural hierarchy. The highest level is the paper. Each paper is divided into one or more experiments. An experiment is a grouping (typically a pairing) of behavioral conditions for which differentially activated locations are reported. Behavioral conditions are specified for each

experiment. Methodological details are specified for each experiment, including imaging modality, tracer, patient population, etc. Each experiment reports one or more activated locations, the lowest level of the hierarchy. Each location (i.e., each x-y-z coordinate) carries its links up the hierarchy, allowing formation at the experiment and paper levels to be rapidly retrieved.

DTIC

**N93-25736\***# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**EVALUATION OF LENS DISTORTION ERRORS IN VIDEO-BASED MOTION ANALYSIS**

JEFFREY POLINER (Lockheed Engineering and Sciences Co., Houston, TX.), ROBERT WILMINGTON (Lockheed Engineering and Sciences Co., Houston, TX.), GLENN K. KLUTE, and ANGELO MICOCCHI (Lockheed Engineering and Sciences Co., Houston, TX.) May 1993. 41 p. (Contract NAS9-17900)

(NASA-TP-3266; S-721; NAS 1.60:3266) Avail: CASI HC A03/MF A01

In an effort to study lens distortion errors, a grid of points of known dimensions was constructed and videotaped using a standard and a wide-angle lens. Recorded images were played back on a VCR and stored on a personal computer. Using these stored images, two experiments were conducted. Errors were calculated as the difference in distance from the known coordinates of the points to the calculated coordinates. The purposes of this project were as follows: (1) to develop the methodology to evaluate errors introduced by lens distortion; (2) to quantify and compare errors introduced by use of both a 'standard' and a wide-angle lens; (3) to investigate techniques to minimize lens-induced errors; and (4) to determine the most effective use of calibration points when using a wide-angle lens with a significant amount of distortion. It was seen that when using a wide-angle lens, errors from lens distortion could be as high as 10 percent of the size of the entire field of view. Even with a standard lens, there was a small amount of lens distortion. It was also found that the choice of calibration points influenced the lens distortion error. By properly selecting the calibration points and avoidance of the outermost regions of a wide-angle lens, the error from lens distortion can be kept below approximately 0.5 percent with a standard lens and 1.5 percent with a wide-angle lens.

Author (revised)

**N93-25815#** Air Force Human Resources Lab., Wright-Patterson AFB, OH. Logistics Research Div.

**A COGNITIVE ARCHITECTURE FOR HUMAN PERFORMANCE PROCESS MODEL RESEARCH Interim Report, Dec. 1991 - Jul. 1992**

MICHAEL J. YOUNG. Nov. 1992. 38 p. (AD-A261040; AL-TP-1992-0054) Avail: CASI HC A03/MF A01

This Technical Paper proposes a new cognitive architecture for human performance process (HPP) model research. HPP models are engineering models of human performance. They represent the human information-processing system as a series of subsystems consisting of input and output, memory, and processing subsystems. HPP models are used in engineering studies of new systems where the goal of the study is to predict human performance. This report proposes a new cognitive architecture for HPP model research. This new architecture is based upon the holon theory of mind previously proposed by Arthur Koestler. The holon theory of mind proposes that mind is both highly modular and hierarchically organized. The report provides an overview of HPP model research, describes the holon theory of mind, and discusses how this theory can form the basis of a new cognitive architecture for HPP model research.

DTIC

**N93-26082\***# Houston Univ., TX. Dept. of Curriculum and Instruction.

**THE ADULT LITERACY EVALUATOR: AN INTELLIGENT COMPUTER-AIDED TRAINING SYSTEM FOR DIAGNOSING ADULT ILLITERATES Final Report**

DAVID B. YADEN, JR. In NASA, Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship



Program, 1992, Volume 2 p 16 Dec. 1992  
(Contract NAG9-562)  
Avail: CASI HC A03/MF A02

An important part of NASA's mission involves the secondary application of its technologies in the public and private sectors. One current application being developed is The Adult Literacy Evaluator, a simulation-based diagnostic tool designed to assess the operant literacy abilities of adults having difficulties in learning to read and write. Using ICAT system technology in addition to speech recognition, closed-captioned television (CCTV), live video and other state-of-the art graphics and storage capabilities, this project attempts to overcome the negative effects of adult literacy assessment by allowing the client to interact with an intelligent computer system which simulates real-life literacy activities and materials and which measures literacy performance in the actual context of its use. The specific objectives of the project are as follows: (1) To develop a simulation-based diagnostic tool to assess adults' prior knowledge about reading and writing processes in actual contexts of application; (2) to provide a profile of readers' strengths and weaknesses; and (3) to suggest instructional strategies and materials which can be used as a beginning point for remediation. In the first and developmental phase of the project, descriptions of literacy events and environments are being written and functional literacy documents analyzed for their components. Examples of literacy events and situations being considered included interactions with environmental print (e.g., billboards, street signs, commercial marquees, storefront logos, etc.), functional literacy materials (e.g., newspapers, magazines, telephone books, bills, receipts, etc.) and employment related communication (i.e., job descriptions, application forms, technical manuals, memorandums, newsletters, etc.). Each of these situations and materials is being analyzed for its literacy requirements in terms of written display (i.e., knowledge of printed forms and conventions), meaning demands (i.e., comprehension and word knowledge) and social situation. From these descriptions, scripts are being generated which define the interaction between the student, an on-screen guide and the simulated literacy environment. The proposed outcome of the Evaluator is a diagnostic profile which will present broad classifications of literacy behaviors across the major areas of metacognitive abilities, word recognition, vocabulary knowledge, comprehension and writing. From these classifications, suggestions for materials and strategies for instruction with which to begin corrective action will be made. The focus of the Literacy Evaluator will be essentially to provide an expert diagnosis and an interpretation of that assessment which then can be used by a human tutor to further design and individualize a remedial program as needed through the use of an authoring system. Author

**N93-26138#** Civil Aeromedical Inst., Oklahoma City, OK.  
**CONTRIBUTION OF PERSONALITY TO THE PREDICTION OF SUCCESS IN INITIAL AIR TRAFFIC CONTROL SPECIALIST TRAINING** Final Report

DAVID J. SCHROEDER, DANA BROACH, and WILLIE C. YOUNG  
Apr. 1993 32 p Presented at the 34th Annual Meeting of the Aerospace Medical Association, Miami, FL Sponsored by Office of Aviation Medicine  
(DOT/FAA/AM-93/4) Avail: CASI HC A03/MF A01

Reviews have consistently concluded that the validity of personality as a predictor of job performance is low. However, a 1991 meta-analysis of studies of personality and job performance demonstrated the utility of the 'Big Five' model of personality in personnel selection and training. This study was designed to evaluate the utility of personality in predicting student success in the FAA's Air Traffic Control Specialist (ATCS) Nonradar Screen Program ('the Screen'). The Screen follows the miniature training, testing, and evaluation paradigm, in which individuals with no prior knowledge of the occupation are taught critical aspects of the job and then assessed on a pass/fail basis for their potential to succeed as controllers. The NEO personality Inventory was administered to 723 men and 307 women at entry into the 9-week Screen. NEO-PI scale scores and cognitive aptitude measures were used to predict final composite scores (COMP) of students. Men and women air traffic students exhibited lower average scores

in Neuroticism, higher average scores in Extroversion, Openness to Experience, and Conscientiousness, and no difference on Agreeableness when compared to normative samples. Correlations between the personality scales and COMP were low for both sexes, ranging from .000 with Impulsiveness, a facet of Neuroticism, to -.0148 with Excitement-seeking, a facet of the Extraversion dimension. Despite the low zero-order correlations, several of the personality facets proved useful in a regression equation, explaining an additional 3 percent of variance in performance over that explained by cognitive aptitude measures. These included the following: Excitement-seeking, Fantasy, Activity, and Ideas. While these results were not entirely consistent with Barrick and Mount (1991), they do offer some support for the role of personality variables in the prediction of success in the ATCS Screen. Continued research is needed to assess the relationship of theoretically-based measures of personality to success on the job over time. Author (revised)

**N93-26307#** Columbia Univ., New York, NY. Dept. of Psychology.

**VISUAL PERCEPTION OF ELEVATION** Annual Report, 1 Jan. - 31 Dec. 1992

LEONARD MATIN 25 Jan. 1993 12 p

(Contract AF-AFOSR-0146-91)

(AD-A261394; REPT-002; AFOSR-93-0084TR) Avail: CASI HC A03/MF A01

The work at the Columbia laboratory concentrated on two matters: (1) expansion of the work on uncovering the laws of spatial summation between and within members of parallel line sets with regard to the influence on the setting of visually perceived eye level (VPEL); and (2) initial work on the separation of components of the body-referenced mechanism and to determine their separate influence on VPEL. The work on summation was reported at 4 presentations at professional meetings in 1992 and a fifth set of experiments has been submitted for presentation in 1993. The completed experimental work on the body-referenced mechanism has been submitted for presentation in 1993. In addition to the above, at Columbia we have begun work in which eye movements are being measured (scleral search coil technique) in conjunction with variation of visual field pitch with the first interest in determining whether a subject's setting of eye level to VPEL is differently influenced by the visual field than is the discrimination of VPEL. DTIC

**N93-26347#** Harvard Univ., Cambridge, MA.

**NEUROPSYCHOLOGICAL COMPONENTS OF OBJECT IDENTIFICATION** Final Technical Report, Dec. 1990 - Nov. 1992

STEPHEN M. KOSSLYN 29 Jan. 1993 19 p

(Contract AF-AFOSR-0100-91)

(AD-A261449; AFOSR-93-0070TR) Avail: CASI HC A03/MF A01

The research supported by this grant focused on the structure of high-level visual processing. Five types of research were conducted: (1) We performed case studies of individual brain-damaged patients. We found evidence that curved edges are processed separately from straight edges and that location information sometimes can be used to encode some characteristics of shape. (2) We tested groups of brain-damaged patients with specific types of lesions. We found evidence that metric information may be used to encode spatial categories (such as above/below), and that imagery may involve some structures that are intact even when the visual field is disrupted. (3) We developed a computerized visual/spatial test battery, and administered it to a group of 19 brain-damaged patients. The results indicate that most of the visual/spatial abilities we examined can be impaired independently, suggesting that at least some distinct subsystems carry out each ability. (4) We implemented computer models and found support for the distinction between subsystems that compute two distinct kinds of spatial relations (metric and category). (5) Some of the tasks we developed to study deficits in brain-damaged patients were used to study the visual-spatial abilities of Air Force pilots; we found that pilots are particularly good at mental rotation and encoding metric distance information. DTIC

**N93-26349#** California Univ., San Diego, La Jolla.  
**NEURAL BASIS OF MOTION PERCEPTION Annual Report, 1 Apr. 1991 - 31 May 1992**

V. S. RAMACHANDRAN 31 May 1992 5 p

(Contract AF-AFOSR-0414-89)

(AD-A261452; AFOSR-93-0050TR) Avail: CASI HC A01/MF A01

Our research is concerned with 'high level' vision with a strong biological slant. The last two or three decades have seen breathtaking progress in the three disciplines--cognitive psychology, AI, and visual neurophysiology--but they have been pursued more or less independently. We believe that the time is now ripe for forging links between these disciplines for an integrated approach to vision. We have had two goals in mind: (1) to develop conceptual links between neurophysiology and perception; and (2) to develop specific tests for computational models of human vision. Our research has called into question several widely accepted dogmas concerning the mechanisms of early vision. Also, we have been able to discover several novel visual phenomena (e.g., motion capture, stereo-capture, etc.) and have identified a wide range of new 'natural constraints' that govern the perception of shape from shading structure from motion and motion correspondence. Also, we have discovered striking perceptual correlates of several well-known physiological observations (e.g., 'phantom contours'-stimuli which selectively activate the magnocellular pathway). DTIC

**N93-26353#** Army Intelligence Center and School, Fort Huachuca, AZ.

**UNITED STATES ARMY SPACE EXPERIMENT 601**

TERRA SCOUT 29 Jul. 1992 195 p

(AD-A261460) Avail: CASI HC A09/MF A03

The original purpose of the Terra Scout experiment was to collect data which could be used to determine the ability of a specialist, in this case an Imagery Analyst (IA), on-board an orbiting platform, to collect valuable information in real time. During seven years of development, the experiment evolved and expanded in scope to include a variety of research and developmental issues described later in this report. DTIC

**N93-26356#** New York Univ., New York.  
**FACILITATION AND INTERFERENCE IN IDENTIFICATION OF PICTURES AND WORDS Annual Report, 1 Dec. 1991 - 30 Nov. 1992**

JOAN G. SNODGRASS 10 Jan. 1993 16 p

(Contract F49620-92-J-0119)

(AD-A261484; AFOSR-93-0085TR) Avail: CASI HC A03/MF A01

This research is concerned with facilitation and interference in the identification of pictures and words. We study facilitation by presenting subjects with fragmented stimuli to identify during study and then test the ability of various types of study stimuli to prime or improve performance on the same stimuli presented again. An important finding from our previous research is that subjects show more priming when they study a picture which is moderately fragmented during study than one which is either very fragmented or almost intact. We accounted for this phenomenon by the perceptual closure hypothesis, which says that experiencing perceptual closure, or completion of an incomplete figure during a study episode, has the most facilitative effect on subsequent identification. We study interference by presenting more degraded versions of a picture or word just prior to the identification test. Perceptual interference is generally observed if a picture or word is preceded by more fragmented versions of itself just prior to identification. Much of our work on this aspect of the research concerns discovering the reason for the perceptual interference. DTIC

**N93-26364#** Stanford Univ., CA. Dept. of Psychology.  
**SPONTANEOUS DISCOVERY AND USE OF CATEGORICAL STRUCTURE Annual Technical Report, 15 Jan. 1992 - 14 Jan. 1993**

JOHN P. CLAPPER and GORDON H. BOWER 15 Feb. 1993 31 p

(Contract AF-AFOSR-0144-91)

(AD-A261658; AFOSR-93-0093TR) Avail: CASI HC A03/MF A01

These experiments investigated unsupervised category learning using tasks in which subjects attempted to memorize the features of training instances from two contrasting categories. On each trial, subjects studied a verbal feature list (training instance) for 24 seconds, after which they were given multiple choice recognition tests to evaluate their memory for each list item. The amount of time spent looking at each feature during the study phase, and the accuracy of recognition during the test phase, provided two separate indices of unsupervised learning on each trial. The main independent variable in these experiments was the specific sequence in which instances from the two categories were presented. The effects of these sequence manipulations on learning provided strong evidence for the use of an explicit, non-incremental, category invention process to capture the consistent structure of the stimulus domain. The present experiments also showed the selective encoding process and enhanced memory for instances predicted by standard, schema-based, theories of learning. DTIC

**N93-26391#** SAM Technology, Inc., San Francisco, CA.  
**PHYSIOLOGICAL INDICES OF MENTAL WORKLOAD Interim Technical Report, 15 Dec. 1991 - 14 Dec. 1992**

ALAN GEVINS and H. M. LEONG 14 Dec. 1992 7 p

(Contract F49620-92-C-0013)

(AD-A261692; AFOSR-93-0086TR) Avail: CASI HC A02/MF A01

We are working on an enabling technology to facilitate the development of physiological indices of mental workload that could be used in high performance aircraft. To date, we have designed and implemented the core components of a neural-network based algorithm for deriving continuous mental workload indices from continuous recordings of brain, scalp muscle, eye and heart electrical activity. We have also designed an experiment to test the adequacy of this algorithm, and have developed technologies to perform the experiment including: (1) designing a task battery to initially test the ability of the network algorithm to generalize across cognitive functions relevant to piloting aircraft; and (2) implementing a software library that could be used to efficiently present the task stimuli using the same personal computer which also collects 32 channels of electrophysiological data. We have tested the integrated system and have found it capable of providing accurate timing of task stimuli, subject responses, and electrophysiological data. DTIC

**N93-26435#** New York Univ., New York.  
**DURATION OF ALPHA SUPPRESSION INCREASES WITH ANGLE IN A MENTAL ROTATION TASK Report, 1 Feb. 1992 - 14 Feb. 1993**

C. M. MICHEL, L. KAUFMAN, and S. J. WILLIAMSON 1 Feb. 1993 27 p

(Contract AF-AFOSR-0221-90)

(AD-A261592; REPT-92-6; AFOSR-93-0055TR) Avail: CASI HC A03/MF A01

Magnetic and electric recordings of average power within the restricted alpha band (10-12 Hz) were made over the parietal and occipital areas of the human scalp while subjects were engaged in the mental imagery task of comparing an object with one previously seen but rotated and perhaps also mirror reflected. Alpha power was found to be suppressed while the subjects were engaged in the comparison, and the duration of suppression increased with the minimum rotation angle to achieve a match. This is additional evidence that the visual cortex is engaged in the process of mental imagery. Moreover, for large rotation angles, where the task is markedly more difficult, a shift in the spatial pattern of suppression indicates that the left parietal area of the cortex becomes involved. DTIC

**N93-26436#** New York Univ., New York.  
**IMAGING REGIONAL CHANGES IN THE SPONTANEOUS ACTIVITY OF THE BRAIN: AN EXTENSION OF THE MINIMUM-NORM LEAST-SQUARES ESTIMATE Manuscript Report, 1 Feb. 1992 - 14 Feb. 1993**

JIA Z. WANG, LLOYD KAUFMAN, and SAMUEL J. WILLIAMSON

20 Jan. 1993 16 p  
(Contract AF-AFOSR-0401-91; AF-AFOSR-0221-90)  
(AD-A261593; REPT-92-5; AFOSR-93-0054TR) Avail: CASI HC  
A03/MF A01

A method was developed to determine the distribution of average spontaneous neuronal activity across the cerebral cortex from measurements of the field pattern across the human scalp. Computations of the mean short-term power, as well as the covariance between pairs of sensors, provide sufficient information to obtain a best estimate for the distribution of mean short-term image current power, as well as the covariance of image current between different locations on cerebral cortex. This method has applications for determining the spatial locations of alpha power suppression as regions of cortex participate in sensory or cognitive functions. DTIC

**N93-26446#** California Univ., San Diego, La Jolla. Dept. of Neurosciences.

**COMPARATIVE ANALYTICAL STUDY OF EVOKED AND EVENT RELATED POTENTIALS AS CORRELATES OF COGNITIVE PROCESSES** Final Technical Report, 1 Feb. 1991 - 31 Oct. 1992

THEODORE H. BULLOCK 21 Dec. 1992 5 p  
(Contract AF-AFOSR-0191-91)

(AD-A261388; AFOSR-93-0043TR) Avail: CASI HC A01/MF A01

This project permitted collaboration between Prof. Erol Basar in Lubeck and Dr. Bullock on new views and analyses of cognitive Event Related Potentials (ERP's), evoked oscillations (Induced Rhythms, IR's) and their relations to the EEG. ERP's have been found for the first time in nonmammalian models (fish, turtles), especially Omitted Stimulus Potentials (OSP's) and oddball ERP' and Mismatch Potentials. To compare the dynamics of these models with human ERP's, a new series of human subjects has been run, extending the range of interstimulus intervals; this showed two types of OSP with distinct dynamics - including a short ISI type not heretofore recognized. Basar and Bullock co-edited a book on a new theme: Induced Rhythms in the Brain (Birkhauser Boston, 1992), with 22 chapters by invited experts. The phenomenon of triggered or modulated oscillations has been known for more than 50 years but not been recognized or studied as a category of brain responses; it is now under active investigation in ours and several other laboratories as a possible correlate of certain kinds of cognition. DTIC

**N93-26449#** Maryland Univ., College Park. Office of Research Administration and Advancement.

**COORDINATED ACTION IN 3-D SPACE** Annual Report, 15 Jan. 1992 - 14 Jan. 1993

ROBERT M. STEINMAN 24 Feb. 1993 7 p  
(Contract AF-AFOSR-0124-91)

(AD-A261418; AFOSR-93-0136TR) Avail: CASI HC A02/MF A01

This grant: (1) tests alternative hypotheses about the mechanism that controls gaze-shifts when nearby objects are manipulated: Two quite different mechanisms have been proposed, namely, on-line feedback, and learned, preplanned patterns of coordinated movements, and (2) studies the speed and accuracy of visually-guided hand movements and the correlation of these performance measures with binocular gaze-errors. The latter studies seek to determine how accurate binocular fixation must be to assure rapid and accurate manual performance in nearby 3-D space. The answer to this (and derivative questions) is not known because, until recently, binocular gaze-errors could not be measured accurately when nearby objects were handled by a subject free to move naturally. During this past year, a unique movement monitoring instrument (the Maryland RFM) was used to make the first measurements that can be used to answer these questions. More than 200 Mb of eye and head movement data were recorded, and detailed analyses are underway. Arrangements have been made to disseminate the answers obtained widely at a number of international conferences during the remaining months of 1993. Manuscripts testing models of shape and size perception and reading of unspaced texts have been in preparation for submission publication soon. DTIC

**N93-26489#** New Hampshire Univ., Durham. Vision Lab.  
**RECEPTORAL AND NEURAL ALIASING** Final Report, 1 Nov. 1989 - 30 Apr. 1992

ROBERT A. SMITH 30 Jan. 1993 46 p

(Contract AF-AFOSR-0126-89)

(AD-A261438; AFOSR-93-0060TR) Avail: CASI HC A03/MF A01

This project saw some unexpected successes, and some even more unexpected failures. Chief among the latter was our total failure to replicate Williams' observations of receptor aliasing, either in the fovea or the parafovea. Despite much communication between us and Williams, no explanation of this discrepancy has been found. We present substantial evidence below to eliminate the possibility of technical failure in our experiments. Unable to study aliasing directly, we pursued a very different approach to the problems of retinal geometry and aliasing: we studied methods to directly map the parafoveal visual field into its constituent summation areas (presumably receptive fields). Although we have not fully solved the very difficult problem of eye-movements, several successful studies were performed, notably: (1) the development of a precise new method for measuring fixation accuracy using afterimages, and (2) studies of spatial summation for isoluminant spots in the parafovea. In addition, a computer model was designed that produces sample ganglion cell lattices and models the process of chromatic identification. Finally, we diverged considerably from the original focus of the project to design what we believe to be the most powerful stimulus display for visual research currently available. This is now a commercial product, showing both scientific and financial success. DTIC

**N93-26521#** New York Univ., New York.

**NEUROMAGNETIC INVESTIGATION OF CORTICAL REGIONS UNDERLYING SHORT-TERM MEMORY** Technical Report, 1 Jul. 1991 - 30 Jun. 1992

Z. L. LU, S. J. WILLIAMSON, and L. KAUFMAN 20 Dec. 1992 8 p

(Contract AF-AFOSR-0401-91)

(AD-A261445; REPT-92-4; AFOSR-93-0056TR) Avail: CASI HC A02/MF A01

Magnetic source imaging (MSI) makes it possible to identify the cortical area in the human brain whose activity reflects the decay of sensory storage of information about sounds (echoic memory). The lifetime for decay of the neuronal activation trace in primary auditory cortex is found to range from 0.8 sec to 3.4 sec for the subjects studied. Extensive behavioral studies that determine the duration of memory for the loudness of a tone show that these physiological measures predict the lifetime of echoic memory to within the uncertainty of 0.2 sec for each of the subjects. DTIC

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### MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

**A93-34012\*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**DEVELOPMENT OF A LARGE SPACE ROBOT - A MULTI-SEGMENT APPROACH. I**

P. D. SPANOS (Rice Univ., Houston, TX) and REGINALD B. BERKA (NASA, Johnson Space Center, Houston, TX) In AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 34th and AIAA/ASME Adaptive Structures Forum, La Jolla, CA, Apr. 19-22, 1993, Technical Papers. Pt. 3 Washington American Institute of Aeronautics and Astronautics 1993 p. 1379-1391. refs (AIAA PAPER 93-1463) Copyright

A concept of multisegment robot (of a class of large space

cranes) is developed for use in space-based construction operations. The robot consists of a collection of segments, which are pinned together to form a snakelike configuration, with a single degree of freedom representing rotation being retained at each pinned connection and with reaction flywheels suspended within each segment for the control necessary to position each body segment. Algorithms are developed for positioning this serpentine robot to a prescribed location and orientation. A multibody dynamics simulation is used to investigate the behavior and interactions of the robot, demonstrating its viability. AIAA

**A93-34013\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

## DEVELOPMENT OF A LARGE SPACE ROBOT - A MULTI-SEGMENT APPROACH. II

REGINALD B. BERKA (NASA, Johnson Space Center, Houston, TX) and P. D. SPANOS (Rice Univ., Houston, TX) /In AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 34th and AIAA/ASME Adaptive Structures Forum, La Jolla, CA, Apr. 19-22, 1993, Technical Papers. Pt. 3 Washington American Institute of Aeronautics and Astronautics 1993 p. 1392-1404. refs (AIAA PAPER 93-1464) Copyright

The paper explores typical robot design issues related to the multisegment robot concept developed by Spanos and Berka (1993) for space-based construction operations. Attention is given to the design, fabrication, and tests of a prototype multisegment robot. Experimental results of motion tests are presented and compared with analytical predictions, showing good agreement. AIAA

**A93-34985**

## THE ROLE OF MENTAL MODELS IN TEAM PERFORMANCE IN COMPLEX SYSTEMS

WILLIAM B. ROUSE (Search Technology, Inc., Norcross, GA), JANIS A. CANNON-BOWERS, and EDUARDO SALAS (U.S. Navy, Naval Training Systems Center, Orlando, FL) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472) vol. 22, no. 6 Nov.-Dec. 1992 p. 1296-1308. Research supported by U.S. Navy refs Copyright

The paper focuses on team performance in complex systems. Representative empirical literature is reviewed and models of team performance are discussed. The role of mental models in team performance is considered and several propositions developed that focus on mental models as mechanisms for forming expectations and explanations of team behaviors. The implications of these propositions for team performance and training are elaborated, particularly in terms of likely performance problems if mechanisms for forming expectations and explanations are deficient. The results of two initial observational studies are reported that support the plausibility of the propositions. Author

**A93-34986**

## AGENT-BASED PILOT-VEHICLE INTERFACES - CONCEPT AND PROTOTYPE

KENNETH H. FUNK, II (Oregon State Univ., Corvallis) and JUDITH H. LIND (U.S. Navy, Naval Air Warfare Center; U.S. Naval Postgraduate School, Monterey, CA) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472) vol. 22, no. 6 Nov.-Dec. 1992 p. 1309-1322. refs Copyright

The task support system (TSS) is an integrative pilot-vehicle interface that consists of a collection of active software units called agents. System agents represent aircraft and environment systems and subsystems, providing databases and control interfaces to support the activities of task agents. Task agents represent tasks the pilot must accomplish in the mission. They assist the pilot by recognizing when the tasks should be started, configuring the cockpit for the tasks, alerting the pilot to potential errors, making recommendations on how to complete tasks, and automating tasks in certain cases. The TSS was evaluated in a simulation experiment

as part of a prototype avionics system. Results of the experiment indicate that the TSS is effective in improving pilot performance and also was well liked by the pilots who tested it. Author

**A93-35235**

## ALTITUDE STRESS AND COSMONAUT TRAINING [VYSOTNYI STRESS I PODGOTOVKA KOSMONAVTOV]

G. A. DAVYDOV, V. G. MASLENNIKOV, and A. I. U. MODIN Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 31-35. In Russian. refs Copyright

An ergonomic concept of the development of altitude stress is presented. According to this concept, altitude stress as a psychophysiological response of an individual to the risk of falling from a height is determined by the number and position, with respect to the person's position, of antifalling contact supports and noncontact supports, i.e., potential supports capable of preventing the fall when the structure situation changes. This concept is also found to be applicable for describing the extravehicular locomotions of cosmonauts with the aid of supports on the basis of which the preliminary ground training of cosmonauts using an altitude-spatial trainer becomes possible. AIAA

**A93-35237**

## MICROFLORA OF CABINS OF MANNED SPACE OBJECTS AND THE PROBLEM OF BIOLOGICAL DAMAGE TO THE STRUCTURAL MATERIALS USED IN THEM [MIKROFLORA KABIN PILOTIRUEMYKH KOSMICHESKIKH OB'EKTOV I PROBLEMA BIOPOVREZHDENII ISPOL'ZUEMYKH V NIKH KONSTRUKSIONNYKH MATERIALOV]

A. N. VIKTOROV, N. D. NOVIKOVA, and E. A. DESHEVAIA Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 41-48. In Russian. refs Copyright

It is found that during the operation of manned space objects, microbial growth can occur on the structural materials of the cabin interior and equipment, which results in biological damage to them. The biodestructing processes can involve single parts of the cabin interior, trainer linkages, connectors, cables, and illuminators. Of the 94 microbial species identified in the spacecraft environment, bacterial flora is represented by 19 genera pertaining to 11 families and 58 species. Mold and yeastlike fungi are represented by 12 genera and consist of 36 species. Significant numbers of isolated microbial species are classified as potentially pathogenic microorganisms. AIAA

**A93-35239**

## ULTRASONIC LOCATION OF GAS BUBBLES IN THE VASCULAR BED OF A PERSON WORKING IN A SPACE SUIT [UL'TRAZVUKOVAIA LOKATSIYA GAZOVYKH PUZYRKOV V KROVENOSNOM RUSLE U CHELOVEKA PRI RABOTE V SKAFANDRE]

V. P. KATUNTSEV, S. N. FILIPENKOV, and O. I. ANISIMOV Aviakosmicheskaya i Ekologicheskaya Meditsina (ISSN 0233-528X) vol. 26, no. 3 May-June 1992 p. 52-55. In Russian. refs Copyright

Results of tests of a procedure of ultrasonic location of gas bubbles (GBs) in man during space suit operations to simulate EVA are presented. During 4-6 hr of work in which pressurized (276-290 mm Hg) space suits were worn, a stable and qualitative signal of arterial blood flow in the lungs was recorded in 7 of 12 tests performed. Cardiac GB formation was observed in two subjects during 6 tests. The maximum intensity of the GB signal was 3-4 points on the Spencer scale, but altitude decompression sickness symptoms did not develop in the test subjects. The risk of developing altitude decompression sickness with and without the use of a space suit is discussed. AIAA

**A93-35530**

## OPERATOR VISION AIDS FOR TELEROBOTIC ASSEMBLY AND SERVICING IN SPACE

THURSTON L. BROOKS and ILHAN INCE (Hughes STX Corp., Lanham, MD) /In 1992 IEEE International Conference on Robotics

and Automation, 8th, Nice, France, May 12-14, 1992, Proceedings. Vol. 1 Los Alamitos, CA IEEE Computer Society Press 1992 p. 886-891.  
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The author presents concepts for operator aids and operational enhancements that improve man-machine control through the visual system. These concepts were derived as part of a study of vision issues for space teleoperation performed for NASA's Flight Telerobotic Servicer (FTS) Project Office. Extensive literature on teleoperation, robotics, and human factors was surveyed to assess the potential of visual enhancements for telerobotic control. The author categorizes potential operator visual aids into three broad classes: camera lighting functions, display enhancements, and visual cues. Author

#### A93-35534

##### MANIPULATOR SYSTEM FOR MODULE REDOCKING ON THE MIR ORBITAL COMPLEX

V. S. SYROMIATNIKOV (NPO Energia, Kaliningrad, Russia) /In 1992 IEEE International Conference on Robotics and Automation, 8th, Nice, France, May 12-14, 1992, Proceedings. Vol. 1 Los Alamitos, CA IEEE Computer Society Press 1992 p. 913-918.  
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There are five docking ports on the transfer adapter of the Mir Orbital Station core: one axial port and four side ones. Initial docking is always accomplished with the axial port. To get to the side ports, the spacecraft or modules have to be undocked, reconfigured, and docked again to a side docking unit. To accomplish this operation a special manipulator system was conceived and designed. The system was developed, tested, and successfully used in space twice. Many specific problems were encountered during this work. The author describes the system, its design, operations and interfaces, as well as ground simulation and testing. The original ground test facility is also presented. Author

#### A93-35536

##### A FORCE-REFLECTING TELEOPERATED HAND SYSTEM FOR THE STUDY OF TACTILE SENSING IN PRECISION MANIPULATION

ROBERT D. HOWE (Harvard Univ., Cambridge, MA) /In 1992 IEEE International Conference on Robotics and Automation, 8th, Nice, France, May 12-14, 1992, Proceedings. Vol. 2 Los Alamitos, CA IEEE Computer Society Press 1992 p. 1321-1326. refs (Contract N00014-90-J-4014)  
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The author describes a teleoperated hand system developed to study the role of tactile and fine-force sensing in telemanipulation. Both master and slave manipulators were two-fingered hands designed for precision tasks that humans typically execute with a pinch grasp. A direct drive, parallel linkage configuration and brushless DC servomotors permit smooth, accurate control of contact forces and small motions, which is essential for effective tactile sensing and display. Initial experiments demonstrated that an operator can perform precision tasks using this system, and that the ability to convey small force levels to the operator required careful attention to the coupling between the operator's finger tips and the master manipulator. The system has been used to demonstrate that a tactile display can convey frictional information sensed at the slave manipulator. Author

A93-35566 Jet Propulsion Lab., California Inst. of Tech., Pasadena.

##### NASA'S TELEROBOTICS RESEARCH PROGRAM

C. R. WEISBIN (JPL, Pasadena, CA) and M. D. MONTEMERLO (NASA, Washington) /In 1992 IEEE International Conference on Robotics and Automation, 8th, Nice, France, May 12-14, 1992, Proceedings. Vol. 3 Los Alamitos, CA IEEE Computer Society Press 1992 p. 2653-2666. refs  
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In 1985, NASA instituted a research program in telerobotics to develop and provide the technology for applications of telerobotics

to the United States space program. The authors describe the goals, organizing framework, and content of that endeavor. They review the actual tasks which comprise the content of the program which has evolved significantly in terms of its content, goals, and approach. The lessons learned in that time comprise the organizing framework of the current program. This organizing framework is described. Author

#### A93-35570

##### GROUND-BASED CONTROL OF SPACE STATION FREEDOM-BASED ROBOTS

S. KALAYCIOGLU and S. SEIFU (Thomson-CSF Systems Canada, Nepean) /In 1992 IEEE International Conference on Robotics and Automation, 8th, Nice, France, May 12-14, 1992, Proceedings. Vol. 3 Los Alamitos, CA IEEE Computer Society Press 1992 p. 2796-2798. Research supported by Canadian Space Agency refs  
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Some of the progress achieved by Thomson-CSF Systems on the mobile servicing system (MSS) Autonomous Robotics Program Phase II is described. The main objective of this program is to develop a concept and its supporting/enabling technologies required to provide a supervised autonomous operation capability for the special purpose dexterous manipulator (SPDM) on the MSS. The MSS is Canada's contribution to the Space Station Freedom. The authors summarize and highlight the important issues of the supervised autonomous robotic system concept. The functional division responsibility between the human operator and the system is outlined. This division is based on existing capabilities and skills of robots and the human operator to provide an effective operational solution as well as to address the problems of time delays and bandwidth restriction. Author

#### A93-35571

##### HERA - A RELIABLE AND SAFE SPACE ROBOT

C. J. M. HEEMSKERK and R. A. BOSMAN (Fokker Space & Systems, Amsterdam, Netherlands) /In 1992 IEEE International Conference on Robotics and Automation, 8th, Nice, France, May 12-14, 1992, Proceedings. Vol. 3 Los Alamitos, CA IEEE Computer Society Press 1992 p. 2799-2801. refs  
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The Hermes Robot Arm (HERA) is a robot that will support the Hermes Spaceplane in its primary mission: the servicing of the Columbus Free Flyer. The emphasis is on the way HERA deals with the uncertainties in its environment, which measures and devices are introduced to ensure reliability and safety, and how to make sure that the design will actually work. The main tasks for HERA concern the external servicing of the Columbus Free Flying Laboratory: exchange of supplies and equipment boxes, inspection of the laboratory outer surfaces, and providing support to astronauts performing extravehicular activities. Author

A93-35914\* National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA.

##### HELMET MOUNTED DISPLAY SYMBOLOGY INTEGRATION RESEARCH

LORAN A. HAWORTH and RONALD E. SEERY (U.S. Army, Aeroflightdynamics Directorate; NASA, Ames Research Center, Moffett Field, CA) /In AHS, Annual Forum, 48th, Washington, June 3-5, 1992, Proceedings. Vol. 1 Alexandria, VA American Helicopter Society 1992 p. 197-213. refs  
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A five-week flight simulation investigation comparing screen/head stabilized Apache Helmet Mounted Display (HMD) flight symbology to world stabilized flight symbology is presented in this paper. Simulation test results indicate that pilots perform significantly ( $P$  is less than .05) better using world stabilized attitude symbology. They were accurate to an average of  $1/2$  deg at estimating terrain relief and aerial target locations. Pilots were able to take advantage of world referenced symbology due to the unique features of HMD that allow the pilot to visually use the symbology at extreme azimuth and elevation off-axis angles. Pilots preferred world stabilized symbology while performing contour flight

tasks. They reported that the use of climb-dive-marker during contour flight greatly reduced pilot work load under conditions tested. A surprising number of cyclic input errors occurred when using both MIL-STD-1295 hover symbology and test symbology, indicating that a better approach for depicting hover symbology is probably warranted. The magnitude of cyclic input and spatial estimation errors increased as the off-axis viewing angle became larger.

Author (revised)

**A93-35918\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**VISUAL CUES IN LOW-LEVEL FLIGHT - IMPLICATIONS FOR PILOTAGE, TRAINING, SIMULATION, AND ENHANCED/SYNTHETIC VISION SYSTEMS**

DAVID C. FOYLE, MARY K. KAISER, and WALTER W. JOHNSON (NASA, Ames Research Center, Moffett Field, CA) In AHS, Annual Forum, 48th, Washington, June 3-5, 1992, Proceedings. Vol. 1 Alexandria, VA American Helicopter Society 1992 p. 253-260. refs

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This paper reviews some of the sources of visual information that are available in the out-the-window scene and describes how these visual cues are important for routine pilotage and training, as well as the development of simulator visual systems and enhanced or synthetic vision systems for aircraft cockpits. It is shown how these visual cues may change or disappear under environmental or sensor conditions, and how the visual scene can be augmented by advanced displays to capitalize on the pilot's excellent ability to extract visual information from the visual scene.

Author

**A93-37070\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**'AND WE WERE TIRED' FATIGUE AND AIRCREW ERRORS**

RICHARD D. RITTER (NASA, Ames Research Center, Moffett Field, CA) IEEE Aerospace and Electronic Systems Magazine (ISSN 0885-8985) vol. 8, no. 3 March 1993 p. 21-26. refs

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Cooper, White, and Lauber analyzed jet-transport accidents worldwide for the period 1968 to 1976 and found more than 60 in which breakdowns of the crew-performance and decision-making process played a pivotal role. It is the contention of this paper that the results reported by Cooper, et al., are related to fatigue and that fatigue is related to sleep deprivation, circadian desynchronization, and lack of good nutrition. It is further argued, and supporting research is cited, that fatigue does not cause loss of skill in flying the aircraft but may have disastrous effects on judgmental and decision-making functions.

Author (revised)

**A93-37300**

**HUMAN FACTORS PROBLEMS FOR AIRCREW-AIRCRAFT INTERFACES - WHERE SHOULD WE FOCUS OUR EFFORTS?**

JUDITH H. LIND and CAROL G. BURGE (U.S. Navy, Naval Air Warfare Center, China Lake, CA) SAFE Journal vol. 23, no. 1 Jan.-Feb. 1993 p. 19-30. refs

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Problem areas where human factors engineers lack the information needed for development of crew stations for advanced military fighter and attack aircraft are discussed. These 28 problem areas are grouped into nine human factors problem categories including physical and physiological stress; vigilance and aircrew alerting; individual differences; information integration; visual displays for various missions; mission management; decision support; automation; and system design and evaluation.

AIAA

**N93-25318#** Sandia National Labs., Albuquerque, NM.

**A HEAT TRANSFER ANALYSIS OF A MOBILE VEHICLE RADIATION-SHIELDED OPERATOR COMPARTMENT**

K. W. SNYDER Dec. 1992 19 p

(Contract DE-AC04-76DP-00789)

(DE93-007428; SAND-92-2392) Avail: CASI HC A03/MF A01

Solar heat gain inside a radiation-shielded forklift operator compartment can be a significant problem due to the 'greenhouse

effect'. Battery power prohibits the use of a refrigerant type of air-conditioning system, which limits the interior temperature to be approximately equal to the outside ambient temperature through alternative cooling methods. A heat transfer analysis is performed to determine the amount of solar heat gain in this type of mobile vehicle shelter. Various results are presented that depend on exterior surface finish and temperature difference between inside and outside ambient. An amount of forced air flow along with several design recommendations are then specified to rid the compartment of this excess heat.

DOE

**N93-25415#** Oak Ridge National Lab., TN.

**HUMAN FACTORS ENGINEERING: A KEY ELEMENT OF INSTRUMENTATION AND CONTROL SYSTEM DESIGN**

H. E. KNEE 1992 10 p Presented at the 39th International Instrumentation Symposium, Albuquerque, NM, 2-6 May 1993 (Contract DE-AC05-84OR-21400)

(DE93-006731; CONF-930561-1) Avail: CASI HC A02/MF A01

Human factors engineering (HFE) has been in existence for a number of decades. Up until recently, however, its application to the design and operation of complex process control environments has been relatively conservative. In the nuclear industry, it took a major accident such as that at Three Mile Island - Unit 2 (TMI-2) to focus attention on the need for systematically accounting for the roles of humans in the control and maintenance of nuclear power plants (NPPs). Since TMI, the nuclear industry has made significant strides in fostering the use of HFE principals. This progress has been slowed to some degree due to the relatively anemic state of the US commercial nuclear power industry; however, new evolutionary and revolutionary nuclear design concepts are utilizing HFE principals and supporting research for advanced HFE concepts. Furthermore, a new Department of Energy (DOE) standard on HFE design criteria is being developed. Since instrumentation and controls (I&C) provide the interface between humans and the systems to be monitored, diagnosed and controlled, much of the HFE work is key to successful I&C. This paper will discuss HFE in the nuclear industry, its recent role in nuclear I&C, and will discuss recent applications and future directions.

DOE

**N93-25531** Michigan Univ., Ann Arbor.

**HELMETED HEAD AND NECK DYNAMICS UNDER WHOLE-BODY VIBRATION Ph.D. Thesis**

BARCLAY PHELPS BUTLER 1992 165 p

Avail: Univ. Microfilms Order No. DA9303701

The military aviator's helmet functions as both protective gear and as an equipment mounting platform for devices that enhance aviator performance. These devices include night vision goggles, head-up displays, sighting systems, and other gear such as multiple visors and chemical protective masks. This additional equipment alters the helmet mass and center of mass, which in turn, increases the load on the muscles of the neck. Sagittally symmetric changes in head supported mass (M) and center of mass (CM) for effects on head and neck posture, acceleration, and neck myoelectric responses under whole-body vibration are investigated. Twelve volunteer male aviators were exposed to short duration axially swept sinusoidal vibration while wearing twelve different helmet configurations. These configurations consisted of three masses of 2, 3, and 4 Kg, and four center of masses of -2, 0, 2 and 4 cm measured relative to the head center of mass in the Anterior/Posterior (AP) direction. Acceleration measurements were made obtaining pitch, AP, and axial motion at T1 and the AO complex. Postural measurements were made using high speed video recordings of the subject's profile. Myoelectric responses were measured using bipolar surface electrodes placed over the right and left infrahyoid, sternocleidomastoid, splenius capitis, and trapezius muscles. Results showed that postural static moments remained constant with no significant changes in head, neck, or trunk angle as a function of vibration frequency, M, or CM parameters. Acceleration measurements showed significant increases in head pitch acceleration at resonance, but no changes in resonant frequency, for changes in M and CM. Consistent resonant frequencies suggest the head and neck system is not a



passive system but is actively controlled by the muscles of the neck. Myoelectric responses in the neck showed significant increases in peak RMS activity for posterior muscles and were highly correlated with head pitch acceleration ( $r$  greater than 0.80). Force calculations about the combined head and helmet center of mass were correlated ( $r$  greater than 0.85) with calibrated posterior neck muscle responses. Acceleration, myoelectric, and force calculation results suggest that significant differences are seen in the responses when added helmet mass exceeds 82 plus or minus 23 N cm relative to the AO complex. Dissert. Abstr.

**N93-25617\*** Lockheed Missiles and Space Co., Sunnyvale, CA.

**SPACE LIFE SUPPORT TECHNOLOGY APPLICATIONS TO TERRESTRIAL ENVIRONMENTAL PROBLEMS**

STEVEN H. SCHWARTZKOPF and HOWARD L. SLEEPER In NASA, Washington, Technology 2002: The Third National Technology Transfer Conference and Exposition, Volume 1 p 537-543 Feb. 1993

Avail: CASI HC A02/MF A04

Many of the problems now facing the human race on Earth are, in fact, life support issues. Decline of air Quality as a result of industrial and automotive emissions, pollution of ground water by organic pesticides or solvents, and the disposal of solid wastes are all examples of environmental problems that we must solve to sustain human life. The technologies currently under development to solve the problems of supporting human life for advanced space missions are extraordinarily synergistic with these environmental problems. The development of these technologies (including both physicochemical and bioregenerative types) is increasingly focused on closing the life support loop by removing and recycling contaminants and wastes to produce the materials necessary to sustain human life. By so doing, this technology development effort also focuses automatically on reducing resupply logistics requirements and increasing crew safety through increased self-sufficiency. This paper describes several technologies that have been developed to support human life in space and illustrates the applicability of the technologies to environmental problems including environmental remediation and pollution prevention.

Author

**N93-25628\*** Army Natick Research and Development Command, MA.

**ASSESSING PATTERNS OF CHANGE IN ANTHROPOMETRIC DIMENSIONS: SECULAR TRENDS OF US ARMY FEMALES, 1946-1988 Final Report, 1 Oct. 1991 - 31 Aug. 1992**

THOMAS M. GREINER and CLAIRE C. GORDON Jan. 1993 75 p

(AD-A260869; NATICK/TR-93/013) Avail: CASI HC A04/MF A01

This report presents an analysis of data gathered in 1946, 1977, and 1988 anthropometric surveys of U.S. Army women to assess long-term changes in body dimensions. Fifteen dimensions are analyzed for two racial/cultural groups: Whites and Blacks. The results of these analyses describe trends that are slow, erratic, and yet statistically significant as linear models. Several hypotheses, drawn from conventional explanations of secular trends, are tested against the anthropometric trends observed in Army women. The application of these hypotheses, however, was deemed to be either inappropriate for these data or unsatisfactory in the ability to explain the observed phenomenon. It is concluded that shifting cultural forces that influence which women join the Army are the most likely cause of the observed patterns. Because these cultural actions have undergone so much change in the last half of the 20th century, it is impossible to establish a basis for predicting the anthropometric dimensions of future populations. Therefore, it is recommended that race-specific data from the most recent anthropometric survey of Army women (1988) be utilized with appropriate race-specific weights to predict Army women's body dimension values in the near future. DTIC

**N93-25778\*** Smith-Kettlewell Inst. of Visual Sciences, San Francisco, CA.

**VISUAL PROCESSING OF OBJECT VELOCITY AND ACCELERATION Annual Technical Report, 16 Jan. 1992 - 15 Jan. 1993**

SUZANNE MCKEE 14 Feb. 1993 3 p

(Contract F49620-92-J-0156)

(AD-A261048; AFOSR-93-0134TR) Avail: CASI HC A01/MF A01

The visual system can use local speed information to determine whether one surface or two transparent surfaces are visible. The local speed signals are very noisy, so a large difference in speed is necessary to produce surface segregation. Once the segregation has occurred, the visual system then integrates the local speed signals associated with each surface to improve the precision of the speed information. To study this phenomenon, speed discrimination was measured for a display composed of random dots all moving in one direction, but at two different speeds. When the speeds were sufficiently different to create the perception of two transparent planes, speed discrimination was as precise for either of the two speeds as when each was viewed alone. The local motion vectors specifying the two speeds had to be present simultaneously to produce segregation (and good speed discrimination). If all dots alternated rapidly between the two speeds in synchrony, no segregation was observed. On the other hand, asynchronous alternation, in which different subsets of dots changed speed in every frame, produced excellent segregation. DTIC

**N93-25787\*** Air Force Human Resources Lab., Brooks AFB, TX.

**MEASURING HEARING PROTECTION DEVICE PERFORMANCE USING THE METROSONICS DB-3100 SOUND LEVEL ANALYZER (DOSIMETER) Final Report, 15 Apr. - 31 Jul. 1992**

ANDREW T. WELLS and PHILLIP L. HOPPER Nov. 1992 23 p

(AD-A260852; AL-TR-1992-0132) Avail: CASI HC A03/MF A01

This report provides detailed operating instructions to be used by base-level bioenvironmental engineers and technicians to determine appropriate personal hearing protection devices (HPD) and to calculate allowable exposure times for individuals wearing different HPD's in hazardous noise. In addition, this report presents a computer program that uses dosimeter time histories from Metrosonics noise dosimeters to streamline and increase the accuracy of HPD assessments. DTIC

**N93-25840\*** Mitre Corp., Bedford, MA.

**MEASURES OF USER-SYSTEM INTERFACE EFFECTIVENESS: AN ENCODING SCHEME AND INDICATORS FOR ASSESSING THE USABILITY OF GRAPHICAL, DIRECT-MANIPULATION STYLE USER INTERFACES**

DONNA L. CUOMO and CHARLES D. BOWEN Jan. 1993 106 p

(AD-A260606; MTR-92B0000047V3) Avail: CASI HC A06/MF A02

The purpose of this MITRE Sponsored Research project was to develop methods and measures for evaluating user-system interface effectiveness for command and control systems with graphical, direct manipulation style interfaces. Due to the increased use of user interface prototyping during concept definition and demonstration/validation phases, the opportunity exists for human factors engineers to apply evaluation methodologies early enough in the life cycle to make an impact on system design. Understanding and improving user-system interface (USI) evaluation techniques is critical to this process. In 1986, Norman proposed a descriptive 'stages of user activity' model of human-computer interaction (HCI). Hutchins, Hollan, and Norman (1986) proposed concepts of measures based on the model which would assess the directness of the engagements between the user and the interface at each stage of the model. We created operational definitions of the concepts of directness, and derived observable indicators that certain types of indirectness may exist in the interface design. This phase of our research program involved using these concepts



as a basis for a methodology of analyzing data collected during usability studies. A usability study was performed on the Military Airspace Management System (MAMS) prototype; four participants' and one user interface expert's data were used for further analysis. DTIC

**N93-25859#** Naval Aerospace Medical Research Lab., Pensacola, FL.

**SIMULATED SUSTAINED FLIGHT OPERATIONS AND PERFORMANCE. PART 1: EFFECTS OF FATIGUE**

D. F. NERI, S. A. SHAPPELL, and C. A. DEJOHN Jul. 1992 22 p  
(AD-A261012) Avail: CASI HC A03/MF A01

Sustained flight operations are likely to produce fatigue and performance decrement in aviators. We assessed changes in cognitive performance using a work/rest schedule modeled on successive long-range attack missions. Twelve subjects performed several subtests of the Unified Tri-Service Cognitive Performance Assessment Battery at the Walter Reed Performance Assessment Battery 18 times during a simulated sustained operation. The scenario consisted of a 9-hr planning session followed by a 4-hr rest period and a 14-hr daytime mission. After 6 hr of rest, subjects repeated this schedule with a nighttime mission. For two spatial tests, subjects showed linear increases in response rate and one of its components, error rate. Subjects appeared to change strategy as the study progressed, possibly exchanging a higher failure rate for a savings in time. Any tendency to take chances when fatigued may have serious implications for aircrew in sustained operations. DTIC

**N93-25867#** Naval Postgraduate School, Monterey, CA.  
**MODELING OF A FULL VISION SYSTEM USING COMBINED VISUAL/HAPTIC SEARCH FOR REMOTE OBJECT IDENTIFICATION M.S. Thesis**

DAVID L. KLEIN Dec. 1992 65 p  
(AD-A260977) Avail: CASI HC A04/MF A01

It is proposed that a hybrid sensory feedback system comprising a visual peripheral component together with a haptic component corresponding to that of visual foveal information, is equivalent to that of full visual sensory feedback. Such a system is constructed and the ability of subjects to perceive objects using it is investigated by observing and classifying their search strategy. Although the provision of a peripheral component provides advantages over a purely haptic system, it is concluded that subjects rely heavily on the haptic data, and the resulting hybrid system is not equivalent to full vision. DTIC

**N93-25888#** Spectra Research Systems, Inc., Huntsville, AL.  
**ADVANCED LIFE SUPPORT STUDY. MODIFICATION 10: ECLSS LOGISTICAL SUPPORT ANALYSIS FOR SPACE STATION FREEDOM Final Report**

30 Jan. 1993 9 p  
(Contract NAS8-38781)  
(NASA-CR-192481; NAS 1.26:192481; SRS/STG-PR93-5738/17)  
Avail: CASI HC A02/MF A01

This addendum to the final report provides a description of the work performed under the subject contract. This report describes the work that was performed by SRS Technologies from Jan. 1992 - Jan. 1993. The work that was performed included the following: (1) a study of the Space Station Freedom (SSF) Preliminary Design Review (PDR) data package and an identification of the maintenance concept, structure, implementation plans, training plan, and the LSAR approach; development of a working ability with the ALSTAR and DATA Express software; (3) a review of the SSF maintenance concept; and (4) an update of the ALSTAR data base. CASI

**N93-25904#** Materials Research Labs., Ascot Vale (Australia).  
**MEMBRANE TECHNOLOGY: A SEARCH FOR MEMBRANES FOR SUBMARINE ATMOSPHERE CONTROL**

S. P. ROE 1992 12 p  
(AD-A260581; MRL-GD-0040; DODA-AR-006-899) Avail: CASI HC A03/MF A01

This overview of membrane technology covers the development of devices which can separate carbon dioxide from air and many other feed gases and the factors influencing selection and performance of such systems. Of the polymeric materials investigated for the separation of carbon dioxide from air, dimethyl silicone (25 percent) rubber membranes exhibit the highest permeability for carbon dioxide, while cellulose acetate exhibits the highest separation factor (10.9) of carbon dioxide to oxygen. However, an immobilized film membrane (IFM) device constructed of a cellulose acetate membrane impregnated with a cesium bicarbonate and sodium arsenite solution exhibits the highest recorded separation factor of 4100. Since a membrane must exhibit a separation factor of at least 100 in order to be effective in any life support system, the IFM method is at present the only approach worthy of further research and development in support of submarine atmosphere control. DTIC

**N93-26047\*#** Maryland Univ., College Park. Dept. of Computer Science.

**ARCHITECTURE OF AUTONOMOUS SYSTEMS Final Report**  
PIYUSH DIKSHIT, KATIA GUIMARAES, MAYA RAMAMURTHY, ASHOK AGRAWALA, and RONALD L. LARSEN Nov. 1986 56 p

(Contract NCC2-414)  
(NASA-CR-192974; NAS 1.26:192974; SDAG-TN-86-01) Avail: CASI HC A04/MF A01

Automation of Space Station functions and activities, particularly those involving robotic capabilities with interactive or supervisory human control, is a complex, multi-disciplinary systems design problem. A wide variety of applications using autonomous control can be found in the literature, but none of them seem to address the problem in general. All of them are designed with a specific application in mind. In this report, an abstract model is described which unifies the key concepts underlying the design of automated systems such as those studied by the aerospace contractors. The model has been kept as general as possible. The attempt is to capture all the key components of autonomous systems. With a little effort, it should be possible to map the functions of any specific autonomous system application to the model presented here. Author (revised)

**N93-26061\*#** Nebraska Univ., Lincoln. Dept. of Industrial and Management Systems Engineering.

**INVESTIGATION OF THE EFFECTS OF EXTRA VEHICULAR ACTIVITY (EVA) AND LAUNCH AND ENTRY (LES) GLOVES ON PERFORMANCE Final Report**

RAM R. BISHU In NASA. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1992, Volume 1 15 p Dec. 1992  
(Contract NGT-44-005-803)  
Avail: CASI HC A03/MF A02

Human capabilities such as dexterity, manipulability, and tactile perception are unique and render the hand as a very versatile, effective and a multipurpose tool. This is especially true for unknown environments such as the EVA environment. In the microgravity environment interfaces, procedures, and activities are too complex, diverse, and defy advance definition. Under these conditions the hand becomes the primary means of locomotion, restraint, and material handling. Facilitation of these activities, with simultaneous protection from the cruel EVA environment are the two, often conflicting, objectives of glove design. The objectives of this study was (1) to assess the effects of EVA gloves at different pressures on human hand capabilities, (2) to devise a protocol for evaluating EVA gloves, (3) to develop force time relations for a number of EVA glove pressure combinations, and (4) to evaluate two types of launch and entry suit gloves. The objectives were achieved through three experiments. The experiments for achieving objectives 1, 2, and 3 were performed in the glove box in building 34. In experiment 1 three types of EVA gloves were tested at five pressure differentials. A number of performance measures were recorded. In experiment 2 the same gloves as in experiment 1 were evaluated in a reduced number of

pressure conditions. The performance measure was endurance time. Six subjects participated in both the experiments. In experiment 3 two types of launch and entry suit gloves were evaluated using a paradigm similar to experiment 1. Currently the data is being analyzed. However for this report some summary analyses have been performed. The results indicate that a) With EVA gloves strength is reduced by nearly 50 percent, b) performance decrements increase with increasing pressure differential, c) TMG effects are not consistent across the three gloves tested, d) some interesting gender glove interactions were observed, some of which may have been due to the extent (or lack of) fit of the glove to the hand, and e) differences in performance exist between partial pressure suit glove and full pressure suit glove, especially in the unpressurized condition.

Author

**N93-26076\*#** Bevill State Community Coll., Fayette, AL. Div. of Natural Sciences.

**DEVELOPMENT OF A PYROLYSIS WASTE RECOVERY MODEL WITH DESIGNS, TEST PLANS, AND APPLICATIONS FOR SPACE-BASED HABITATS Final Report**

BOBBY J. ROBERSON /n NASA, Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1992, Volume 2 13 p Dec. 1992 (Contract NGT-44-005-803)

Avail: CASI HC A03/MF A02

Extensive literature searches revealed the numerous advantages of using pyrolysis as a means of recovering usable resources from inedible plant biomass, paper, plastics, other polymers, and human waste. A possible design of a pyrolysis reactor with test plans and applications for use on a space-based habitat are proposed. The proposed system will accommodate the wastes generated by a four-person crew while requiring solar energy as the only power source. Waste materials will be collected and stored during the 15-day lunar darkness periods. Resource recovery will occur during the daylight periods. Usable gases such as methane and hydrogen and a solid char will be produced while reducing the mass and volume of the waste to almost infinitely small levels. The system will be operated economically, safely, and in a non-polluting manner.

Author

**N93-26088\*#** Life Systems, Inc., Cleveland, OH.  
**INTEGRATED OXYGEN RECOVERY SYSTEM Technical Progress Report No. 2, 9 Mar. - 7 May 1993**

M. GENE LEE and RONALD J. DAVENPORT 7 May 1993 22 p

(Contract NAS8-39843)

(NASA-CR-192982; NAS 1.26:192982; TR-1619-1-2) Avail: CASI HC A03/MF A01

Life Systems has conceptualized an innovative Integrated Oxygen Recovery System (IORS) applicable to advanced mission air revitalization. The IORS provides the capability to electrochemically generate metabolic oxygen (O<sub>2</sub>) and recover O<sub>2</sub> from the space habitat atmosphere via a carbon dioxide (CO<sub>2</sub>) reduction process within a single assembly. To achieve this capability, the IORS utilizes a Solid Metal Cathode (SMC) water electrolysis unit that simultaneously serves as the Sabatier CO<sub>2</sub> reduction reactor. The IORS enables two major life support systems currently baselined in closed loop air revitalization systems to be combined into one smaller, less complex system. This concept reduces fluidic and electrical interface requirements and eliminates a hydrogen (H<sub>2</sub>) interface. Life Systems is performing an evaluation of the IORS process directed at demonstrating performance and quantifying key physical characteristics including power, weight, and volume. The results of the checkout, shakedown, and initial parametric tests are summarized.

Author (revised)

**N93-26089#** Galaxy Scientific Corp., Pleasantville, NJ.  
**HUMAN FACTORS IN AVIATION MAINTENANCE, PHASE 2 Final Report**

Apr. 1993 200 p

(DOT/FAA/AM-93/5) Avail: CASI HC A09/MF A03

In the second phase of research on Human Factors in Aviation Maintenance, the emphasis evolved from problem definition to development of demonstrations and prototypes. These demonstrations include a computer-based training simulation for troubleshooting an airliner environmental control system and a software system to store and display documents. Laboratory and workplace evaluations of work cards, lighting, experimental systems for inspection training, and the initial effects of communication training for maintenance workers are described. A chapter of the Human Factors Guide for Aircraft Maintenance is described.

Author (revised)

**N93-26153\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**AUTOMATION AND ROBOTICS HUMAN PERFORMANCE Annual Report, FY 1989**

ROBERT W. MAH 17 Jan. 1990 135 p

(NASA-CR-193049; NAS 1.26:193049) Avail: CASI HC A07/MF A02

The scope of this report is limited to the following: (1) assessing the feasibility of the assumptions for crew productivity during the intra-vehicular activities and extra-vehicular activities; (2) estimating the appropriate level of automation and robotics to accomplish balanced man-machine, cost-effective operations in space; (3) identifying areas where conceptually different approaches to the use of people and machines can leverage the benefits of the scenarios; and (4) recommending modifications to scenarios or developing new scenarios that will improve the expected benefits. The FY89 special assessments are grouped into the five categories shown in the report. The high level system analyses for Automation & Robotics (A&R) and Human Performance (HP) were performed under the Case Studies Technology Assessment category, whereas the detailed analyses for the critical systems and high leverage development areas were performed under the appropriate operations categories (In-Space Vehicle Operations or Planetary Surface Operations). The analysis activities planned for the Science Operations technology areas were deferred to FY90 studies. The remaining activities such as analytic tool development, graphics/video demonstrations and intelligent communicating systems software architecture were performed under the Simulation & Validations category.

Author (revised)

**N93-26229#** Naval Health Research Center, San Diego, CA.  
**COMBINED STRENGTH AND ENDURANCE TRAINING: FUNCTIONAL AND MORPHOLOGICAL ADAPTATIONS TO TEN WEEKS OF TRAINING Final Report, May - Sep. 1991**

J. MCCARTHY, P. GRIFFITH, W. K. PRUSACZYK, H. W. GOFORTH, JR., and A. VAILAS 29 Sep. 1992 20 p (AD-A261059; NHRC-92-26) Avail: CASI HC A03/MF A01

The literature suggests that muscular strength development can be inhibited when endurance and strength training programs are combined. The purpose of this study was to examine the effects of strength and endurance training programs, individually and in combination, on performance changes and associated muscle adaptations. Sedentary males (n=30) were randomly assigned to one of three training groups: strength-only (STR), endurance-only (END), or combined strength and endurance (COM). Subjects trained three days per week for ten weeks. Strength training consisted of select upper and lower body resistance exercises (three maximal effort sets, five to seven repetitions per set). Endurance training consisted of continuous cycling for 50 min at 70% heart rate reserve (HRR). Subjects in COM engaged in both the strength and endurance training programs on the same day. Anthropometric characteristics, strength, and peak oxygen uptake (cycling) were measured; biopsies were taken from the vastus lateralis muscle; and computed tomography (CT) scans were performed on mid-thigh before and after ten weeks of training. Groups STR and COM showed significant (p less than 0.05) increases in: one-repetition maximum squat (23%, 22%) and bench press (18%, 18%); vertical jump (6%, 9%); lean body weight (3%, 5%); mid-thigh girth (3%, 4%); fast twitch (FT) muscle fiber area (24%, 28%); mean muscle fiber area (21%, 23%); thigh extensor (12%, 14%) and flexor (7%,

6%) areas. All groups exhibited significant increases in peak oxygen uptake following training END (18%), COM (16%), and STR (9%). These results suggest that combining strength and endurance training programs can produce significant concurrent gains in muscular strength and power, muscle hypertrophy, and peak oxygen uptake. DTIC

**N93-26265#** Army Aeromedical Research Lab., Fort Rucker, AL. Sensory Research Div.

**INTERPUPILLARY AND VERTEX DISTANCE EFFECTS ON FIELD-OF-VIEW AND ACUITY WITH ANVIS Final Report**

JAMES M. KING and STEPHEN E. MORSE Jan. 1993 44 p (Contract DA PROJ. 3M1-62787-A-879)

(AD-A261259; USAARL-93-9) Avail: CASI HC A03/MF A01

Third generation Aviation Night Vision Imaging Systems (ANVIS) employ vertical, tilt, interpupillary distance, vertex distance, and focus adjustments. ANVIS field-of-view is nominally 40 degrees but can be limited by adjustments. Interpupillary distance effects on ANVIS field-of-view have been computed, but seldom measured. There have been reports of acuity loss at the periphery of ANVIS fields-of-view. Fields-of-view were measured in 10 subjects, acuities in 8. ANVIS were used with a 10-foot working distance. Acuities were Assessed using Bailey-Lovie charts. At the 18 mm vertex distance, binocular and monocular fields-of-view decreased with decentration. At the 32 mm vertex distance, binocular and monocular fields-of-view were reduced at optimal interpupillary distance, and decreased with increasing decentration. The total horizontal field-of-view at 32 mm vertex distance was increased by increasing decentration, offsetting the reduction caused by increased vertex distance. Acuity was relatively insensitive to changes in vertex distance and interpupillary distance, but was substantially reduced in the periphery of the field-of-view, and under low contrast. DTIC

**N93-26404#** Army Natick Research and Development Command, MA.

**ANTHROPOMETRY OF THE FOOT AND LOWER LEG OF U.S. ARMY SOLDIERS: FORT JACKSON, SC Final Report, Jun. 1985 - Dec. 1988**

KENNETH R. PARHAM, CLAIRE C. GORDON, and CAROLYN K. BENSEL Sep. 1992 358 p (AD-A261405; NATICK/TR-92/028) Avail: CASI HC A16/MF A03

In 1985, a fit test for a leather combat boot, which was recently adopted by the US Army, was conducted at Fort Jackson, South Carolina by the US Army Natick Research, Development and Engineering Center. In conjunction with the fit test, a series of 33 anthropometric measurements of the foot and lower leg (including stature and weight) was obtained on 867 male and female soldiers. This report presents statistical information for those data on the full male sample (n=293) and on a female subsample (n=491), which has been reconfigured to represent more closely the demographic composition of the current US Army female population. In addition to measurement descriptions and summary statistics for each variable by gender, bivariate and multivariate relationships in the data are also presented. This includes bivariate tables, correlation coefficients, and both simple and multiple regression equations. These data represent the most comprehensive anthropometric information on the foot collected to date. As such, the statistical information presented in this report should be of value to scientists and to developers of both military and civilian footwear. DTIC

## SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

**A93-36551**

**WATER IN THE SOLAR SYSTEM AND ITS ROLE IN EXOBIOLGY; PROCEEDINGS OF THE EUROPEAN GEOPHYSICAL SOCIETY GENERAL ASSEMBLY, 26TH, WIESBADEN, GERMANY, APR. 22-26, 1991**

ANDRE BRACK, ED. (CNRS, Centre de Biophysique Moléculaire, Orleans, France) and GERDA HORNECK, ED. (DLR, Inst. fuer Flugmedizin, Cologne, Germany) Origins of Life and Evolution of the Biosphere (ISSN 0169-6149) vol. 23, no. 1 Feb. 1993 94 p. For individual items see A93-36552 to A93-36559 Copyright

The present conference on the role of solar system water and its role in exobiology discusses the deuterium/hydrogen ratio and the evolution of water in the terrestrial planets, the simulation of organic grain mantles, and the role of water molecules in bacteria and viruses. Also discussed are responses of bacillus subtilis spores to space environments, a comparison of membrane ATPases from extreme halophiles isolated from ancient salt deposits, the exobiological role of the cryoprotective properties of water, and life in hot springs and hydrothermal vents. AIAA

**A93-36552**

**LIQUID WATER AND THE ORIGIN OF LIFE**

ANDRE BRACK (CNRS, Centre de Biophysique Moléculaire, Orleans, France) Origins of Life and Evolution of the Biosphere (ISSN 0169-6149) vol. 23, no. 1 Feb. 1993 p. 3-10. Water in the solar system and its role in exobiology; Proceedings of the European Geophysical Society General Assembly, 26th, Wiesbaden, Germany, Apr. 22-26, 1991. A93-36551 14-55 refs Copyright

In the presence of liquid water, which established hydrogen bonds and has both high polarity and high dielectric constant, large organic molecules must manage a powerful conflict between hydrophobic and hydrophilic groups that generates prebiotic circumstances. These circumstances include the stereoselective aggregation of short peptide sequences of alternating hydrophobic/hydrophilic residues into thermostable beta-sheets that are chemically active. Attention is drawn to the similarities in the hydrological early histories of the earth and Mars. AIAA

**A93-36554\*** National Aeronautics and Space Administration, Washington, DC.

**LABORATORY SIMULATION OF ORGANIC GRAIN MANTLES**

CELIA X. MENDOZA-GOMEZ and J. M. GREENBERG (Leiden State Univ., Netherlands) Origins of Life and Evolution of the Biosphere (ISSN 0169-6149) vol. 23, no. 1 Feb. 1993 p. 23-28. Water in the solar system and its role in exobiology; Proceedings of the European Geophysical Society General Assembly, 26th, Wiesbaden, Germany, Apr. 22-26, 1991. A93-36551 14-55 Research supported by Univ. Nacional Autonoma de Mexico refs (Contract NGR-33-018-148) Copyright

Laboratory simulations have been conducted of interstellar space conditions conducive to grain mantle evolution, including the photoproduction of a material which resembles the organic refractory mantle on interstellar grains. Upon analysis by various methods these organic refractory samples are noted to consist of a complex mixture of long, cross-linked chains, with a high probability of being aromatic carbon molecules. AIAA

**A93-36556**

**RESPONSES OF BACILLUS SUBTILIS SPORES TO SPACE ENVIRONMENT - RESULTS FROM EXPERIMENTS IN SPACE**

GERDA HORNECK (DLR, Inst. fuer Flugmedizin, Cologne, Germany) Origins of Life and Evolution of the Biosphere (ISSN

0169-6149) vol. 23, no. 1 Feb. 1993 p. 37-52. Water in the solar system and its role in exobiology; Proceedings of the European Geophysical Society General Assembly, 26th, Wiesbaden, Germany, Apr. 22-26, 1991. A93-36551 14-55 refs Copyright

Aboard several spacecraft (Apollo 16, Spacelab 1, LDEF), spores of *Bacillus subtilis* were exposed to selected parameters of space, such as space vacuum, different spectral ranges of solar UV-radiation, and cosmic rays, separately or in combination. Their survival and genetic changes after retrieval are studied. The spores survive extended periods of time in space (up to several years) if protected against the high influx of solar UV-radiation. Water desorption caused by the space vacuum leads to structural changes of the DNA; the consequences are an increased mutation frequency and altered photobiological properties of the spores. UV-effects, such as killing and mutagenesis, are augmented, if the spores are in space vacuum during irradiation. Vacuum-specific photoproducts which are different from the 'spore photoproduct' may cause a synergistic response of spores to the simultaneous action of UV and vacuum. The experiments provide an experimental test of certain steps of the panspermia hypothesis.

Author (revised)

#### A93-36558

##### **CRYOPROTECTIVE PROPERTIES OF WATER IN THE EARTH CRYOLITHOSPHERE AND ITS ROLE IN EXOBIOLGY**

D. A. GILICHINSKII (Russian Academy of Sciences, Inst. of Soil Science and Photosynthesis, Pushchino, Russia), V. S. SOINA, and M. A. PETROVA (Moscow State Univ., Russia) *Origins of Life and Evolution of the Biosphere* (ISSN 0169-6149) vol. 23, no. 1 Feb. 1993 p. 65-75. Water in the solar system and its role in exobiology; Proceedings of the European Geophysical Society General Assembly, 26th, Wiesbaden, Germany, Apr. 22-26, 1991. A93-36551 14-55 refs

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In permanently frozen rocks, where water occurs in all three phases, as much as 2-7 percent of the water remains in the unfrozen state and represents thin films enveloping organic-mineral particles; these films can serve as cryoprotectors against cell damage by ice crystals over geologically significant periods. Electron microscopy examinations of prokaryotes have shown well preserved outer cell structures, and these cells are found to be resistant to water phase transitions through 0 C. Attention is drawn to the exobiological implications of envisioning the earth's permafrost as a model of its Martian counterpart, to a first approximation.

AIAA

#### A93-36560

##### **SOME BIOCHEMICAL PROPERTIES OF AN ACYCLIC OLIGONUCLEOTIDE ANALOGUE - A PLAUSIBLE ANCESTOR OF THE DNA?**

LILIANE MERLE, GERARD SPACH, YVES MERLE (Rouen Univ., Mont-Saint-Aignan, France), JANOS SAGI, and ATTILA SZEMZO (Hungarian Academy of Sciences, Central Research Inst. for Chemistry, Budapest, Hungary) *Origins of Life and Evolution of the Biosphere* (ISSN 0169-6149) vol. 23, no. 2 April 1993 p. 91-103. refs

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The biochemical properties of acyclic oligonucleotides, which are considered to be a primitive model of DNA or RNA in prebiotic times, were studied. Experimental evidence obtained from UV spectroscopy and size exclusion chromatography is reported for the first time that (GlyT)<sub>12</sub>, the acyclic analog of the oligothymidylate, can serve as primer in two enzymatic polymerizations using the Klenow DNA polymerase with a template or the terminia; deoxynucleotidyl transferase (without template).

AIAA

#### A93-36561

##### **PHOTO AND THERMAL REACTIONS OF FERROUS HYDROXIDE**

DAVID MAUZERALL, ZOFIA BOROWSKA, and IRENE ZIELINSKI (Rockefeller Univ., New York) *Origins of Life and Evolution of*

the Biosphere (ISSN 0169-6149) vol. 23, no. 2 April 1993 p. 105-114. Research supported by Rockefeller Univ. refs (Contract NSF DMB-90-16973) Copyright

An attempt is made to improve the yields of formaldehyde obtained previously by the reaction of ferrous hydroxide with carbon dioxide at pH 6-10. It is shown that a claim of the reduction of carbon dioxide to formaldehyde at neutral pH with near UV light is a mistake. The evidence is presented that this reaction does not occur under these conditions, and the yield is less than 1 percent of that previously claimed. The thermal reaction to form hydrogen has a small activation energy of 7 kcal/mole. It is concluded that thermal and photochemical formation of hydrogen from ferrous ion in the Archaean ocean could be comparable at pH 8-9.

AIAA

#### A93-36563

##### **CHIRAL-SYMMETRY-BREAKING IN NONEQUILIBRIUM CHEMICAL SYSTEMS - THE RACEMIZATION INFLUENCE**

M. CATTANI and TANIA TOME (Sao Paulo Univ., Brazil) *Origins of Life and Evolution of the Biosphere* (ISSN 0169-6149) vol. 23, no. 2 April 1993 p. 125-136. Research supported by CAPES refs

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The chiral-symmetry-breaking phenomenon in an auto-catalytic chemical model (Kondepudi and Nelson, 1984) where matter is continuously introduced and removed from the system at different rates is analyzed. This model is extended to take into account racemization effects responsible for the interconversion of the left- and right-handed enantiomers. The steady states of the chemical system are analyzed as a function of the matter pumping and the racemization rate.

AIAA

#### A93-36564

##### **CHIRAL SYMMETRY BREAKING IN NONLINEAR AUTOCATALYTIC REACTIONS AND THE EFFECT OF EXTERNAL NOISE**

K. TENNAKONE and L. P. M. VITHARANA (Inst. of Fundamental Studies, Kandy, Sri Lanka) *Origins of Life and Evolution of the Biosphere* (ISSN 0169-6149) vol. 23, no. 2 April 1993 p. 137-143. refs

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A mathematical model based on difference equations is presented to show that minute chiral perturbations are sufficient for spontaneous breaking of L, D symmetry in nonlinear autocatalytic reactions. The effect of noise on rate constants is analyzed and it was noted that, below a critical noise level, the influence of the chiral perturbation results selection of the biased isomer with certainty.

Author

N93-26157\*# Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.

##### **PLANETARY BIOLOGY AND MICROBIAL ECOLOGY: MOLECULAR ECOLOGY AND THE GLOBAL NITROGEN CYCLE**

MOLLY STONE NEALSON, ed. and KENNETH H. NEALSON, ed. Washington Mar. 1993 194 p

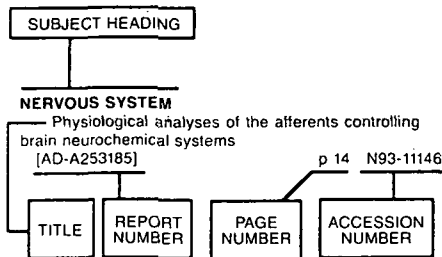
(Contract NAGW-2436)

(NASA-CR-4497; NAS 1.26:4497) Avail: CASI HC A09/MF A03

This report summarizes the results of the Planetary Biology and Molecular Ecology's summer 1991 program, which was held at the Marine Biological Laboratory in Woods Hole, Massachusetts. The purpose of the interdisciplinary PBME program is to integrate, via lectures and laboratory work, the contributions of university and NASA scientists and student interns. The goals of the 1991 program were to examine several aspects of the biogeochemistry of the nitrogen cycle and to teach the application of modern methods of molecular genetics to field studies of organisms. Descriptions of the laboratory projects and protocols and abstracts and references of the lectures are presented.

Author (revised)

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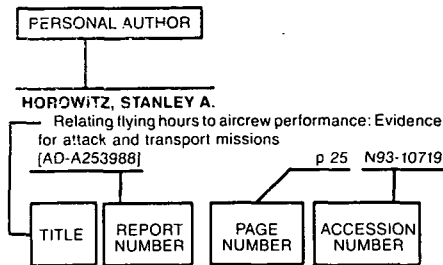
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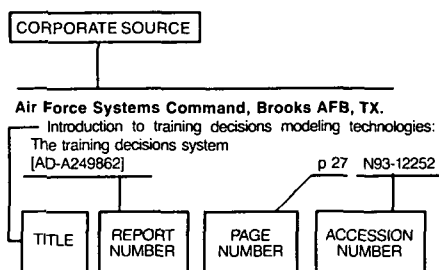
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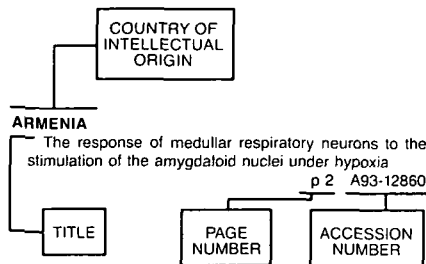
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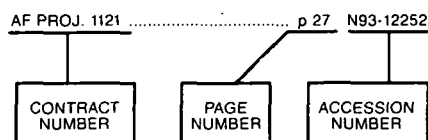


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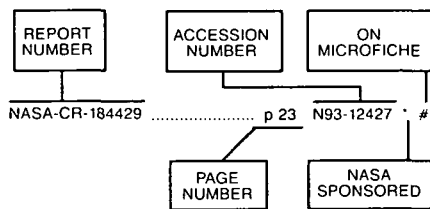
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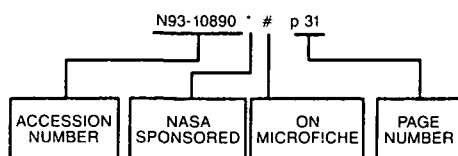
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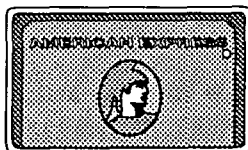
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